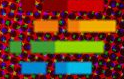
NEXT-GENERATION MICROSERVICES

PRINCIPLES, PRACTICES & REIMAGINED RULES OF ENGAGEMENT FOR UPSTARTS, MASTERS & EVERY FLAVOR OF SUPER HERO

BURR SUTTER
DIRECTOR, DEVELOPER EXPERIENCE
RED HAT
@BURRSUTTER

RIGA DEVDAYS 2019

bit.ly/RigaBurr2019



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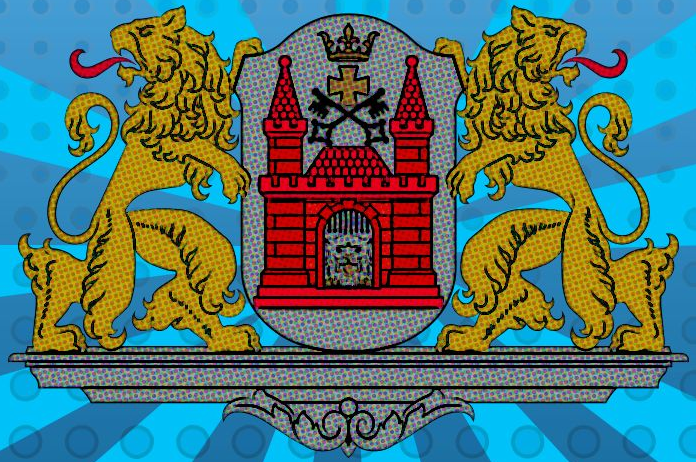
MEANWHILE, IN THE LAND OF SUPER-FAST INTERNET ...



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THEY CAME BEARING GIFTS ... BOOKS ... MADE OF PAPER!

(OR BETTER YET, GO TO)

BIT.LY/ISTIOBOOK

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MORE RESOURCES AVAILABLE FROM DEVOXX BELGIUM 2018

DEVOXX™ BELGIUM

HTTP://BIT.LY/2XIWXPG

"EXCELLENT STUFF.. WORTH 3 HOURS SPENDING TO WATCH THIS VIDEO.. REALLY LOVED IT. WILL GIVE A COMPLETE PICTURE ON KUBERNETES AND HOW IT WORKS." - PRADEEP

WHAT DO YOU SEE & HEAR IN YOUR OWN ORGANIZATION?

ARE CUSTOM SOFTWARE APPS/APIS A KEY STRATEGIC ADVANTAGE FOR YOUR ORGANIZATION?

DO YOU REGARD IT AS A COST CENTER THAT MUST BE BETTER STREAMLINED?

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Journey to Awesomeness

DevOps

Self-Service, On-Demand, Elastic Infrastructure

Automation

CI & CD Deployment Pipeline

Advanced Deployment Techniques

Next-Generation Microservices

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Force Multipliers & Superpowers

Wonder Woman Style

Boomerang Tiara	Indestructible Bracelets	Lasso of Truth	Amazonian Shield	Hand-to-Hand Combat	Superhuman Strength
Re-Org to DevOps	Self-Service, On-Demand, Elastic Infrastructure	Automation Puppet, Chef, Ansible, Kubernetes	CI & CD Deployment Pipeline	Advanced Deployment Techniques	Microservices

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12 'Ways' of the Cloud-Native Warrior

1. DevOps & Agile
2. Skill Portability
3. On-Demand - Never Wait & Always Automate
4. Pipeline Throughput, Deployment Interval, Optimize for Learning
5. Deployment Techniques
6. Application Architecture vs Application Infrastructure
7. Linux Containers
8. Kubernetes/OpenShift & Hybrid Cloud
9. Service Mesh: Observability, Security, Traffic Control (Istio)
10. Serverless Serving (Knative)
11. Build In Cluster (Tekton)
12. Beyond HTTP (AMQP, Kafka, Knative Eventing, Camel-K)

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Adapt what is useful, reject what is useless, and add what is specifically your own.

— *Bruce Lee*

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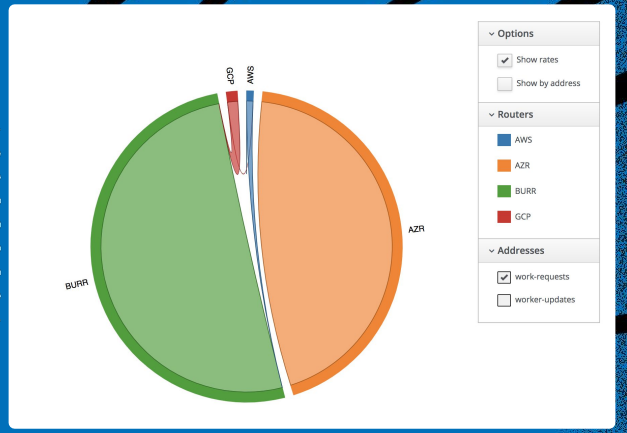
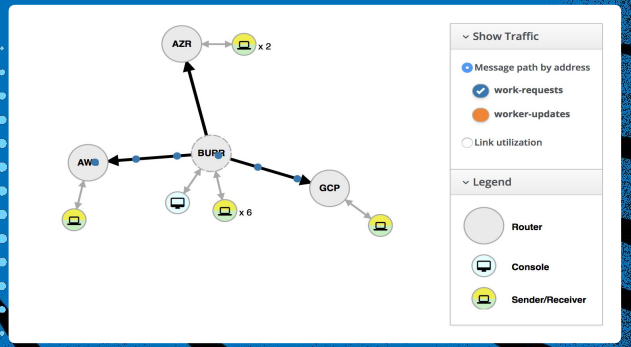
OpenShift
Message Processor (Worker)
AMQ

OpenShift
Message Processor (Worker)
AMQ

OpenShift
Message Processor (Worker)
AMQ

OpenShift
Message Processor (Worker)
AMQ





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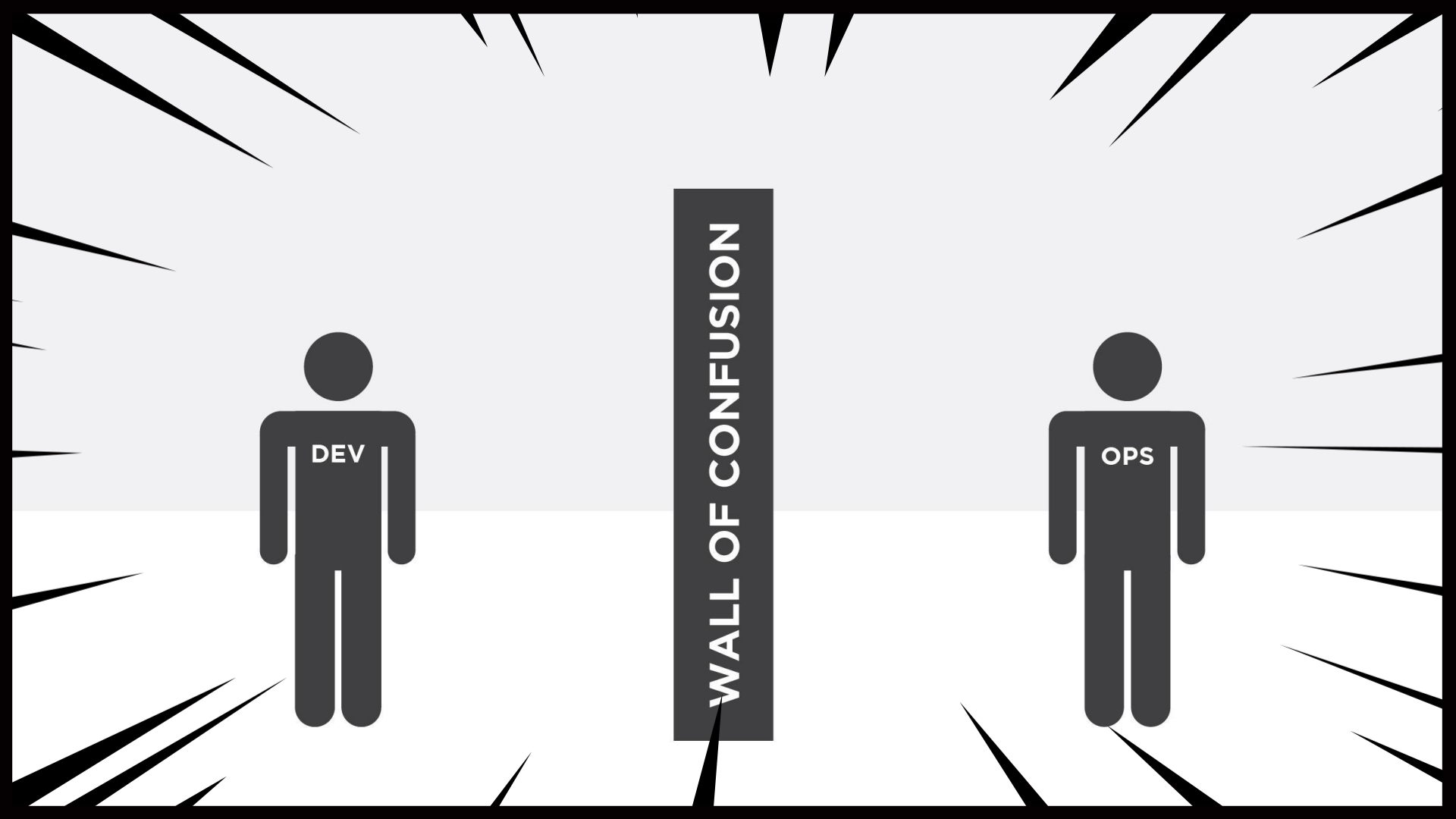
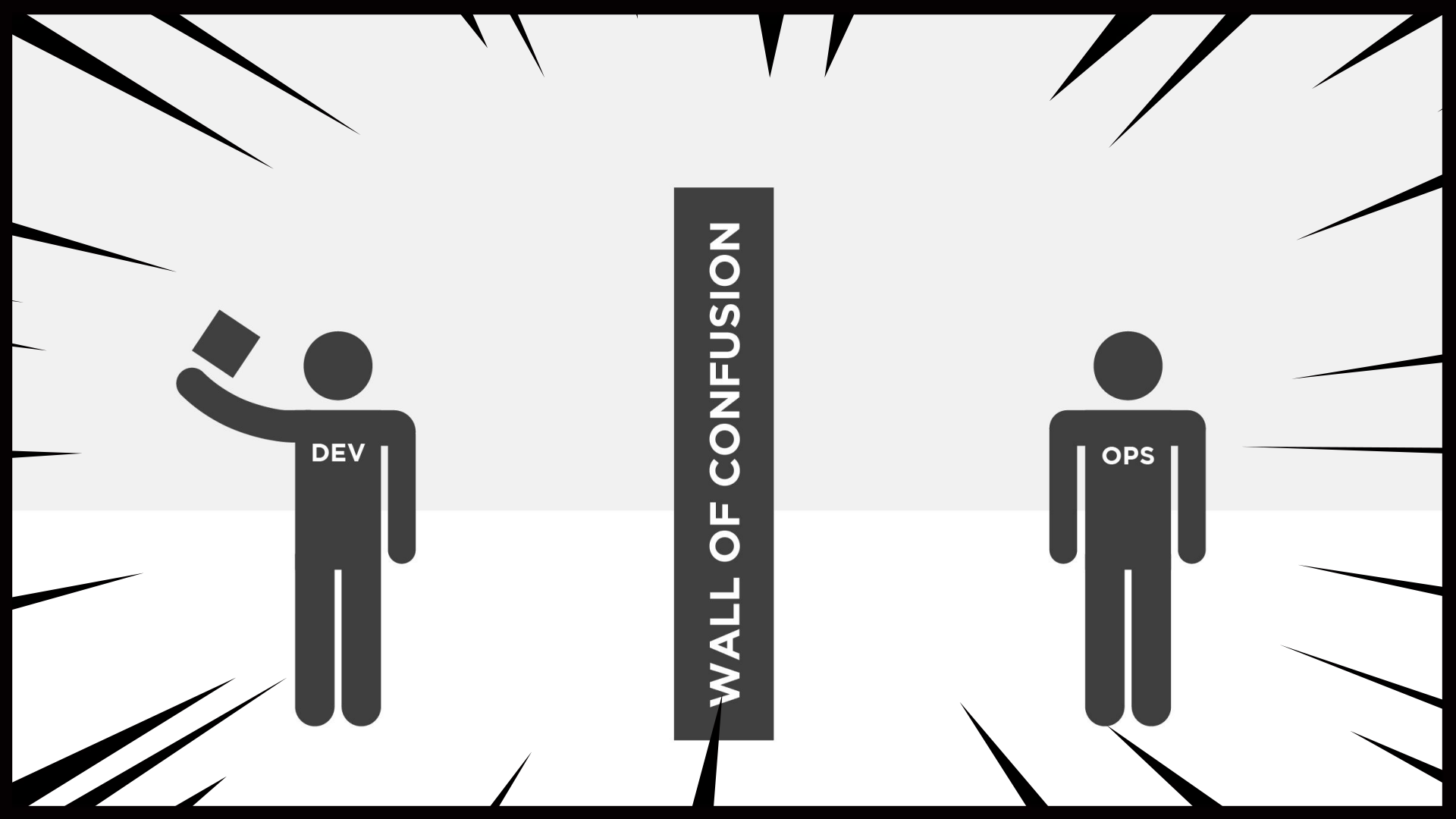

DEV
WALL OF CONFUSION
OPS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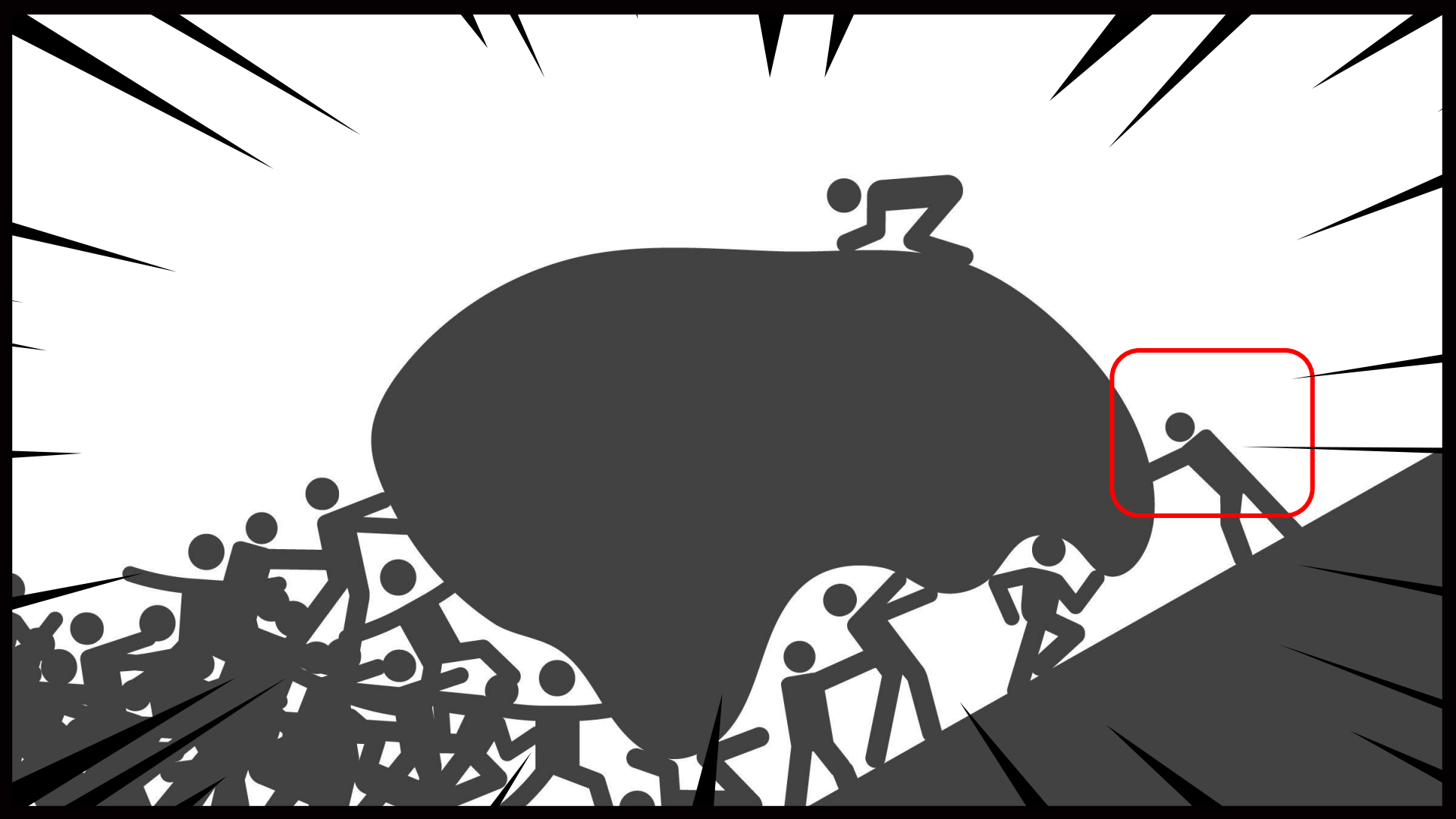
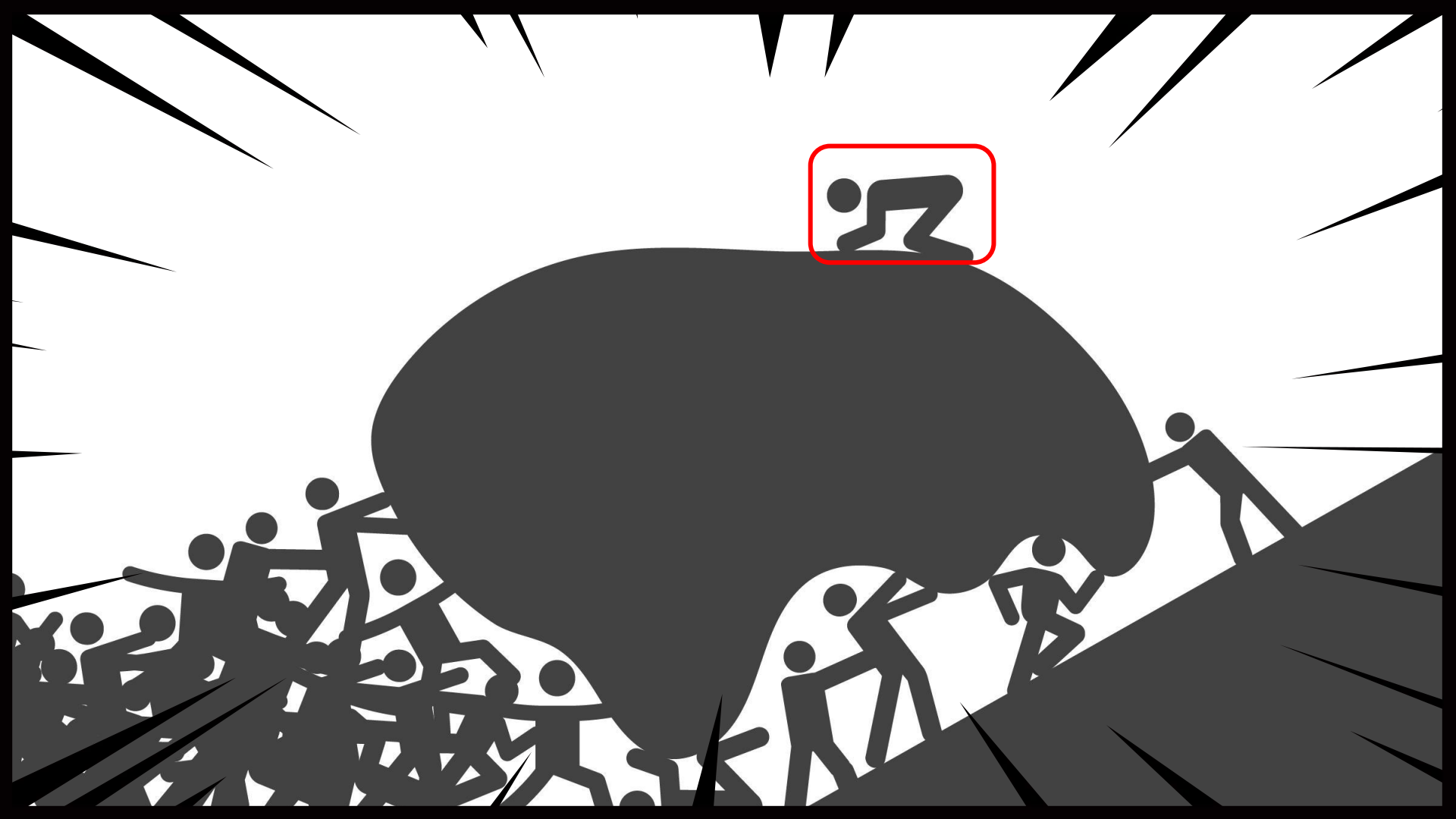
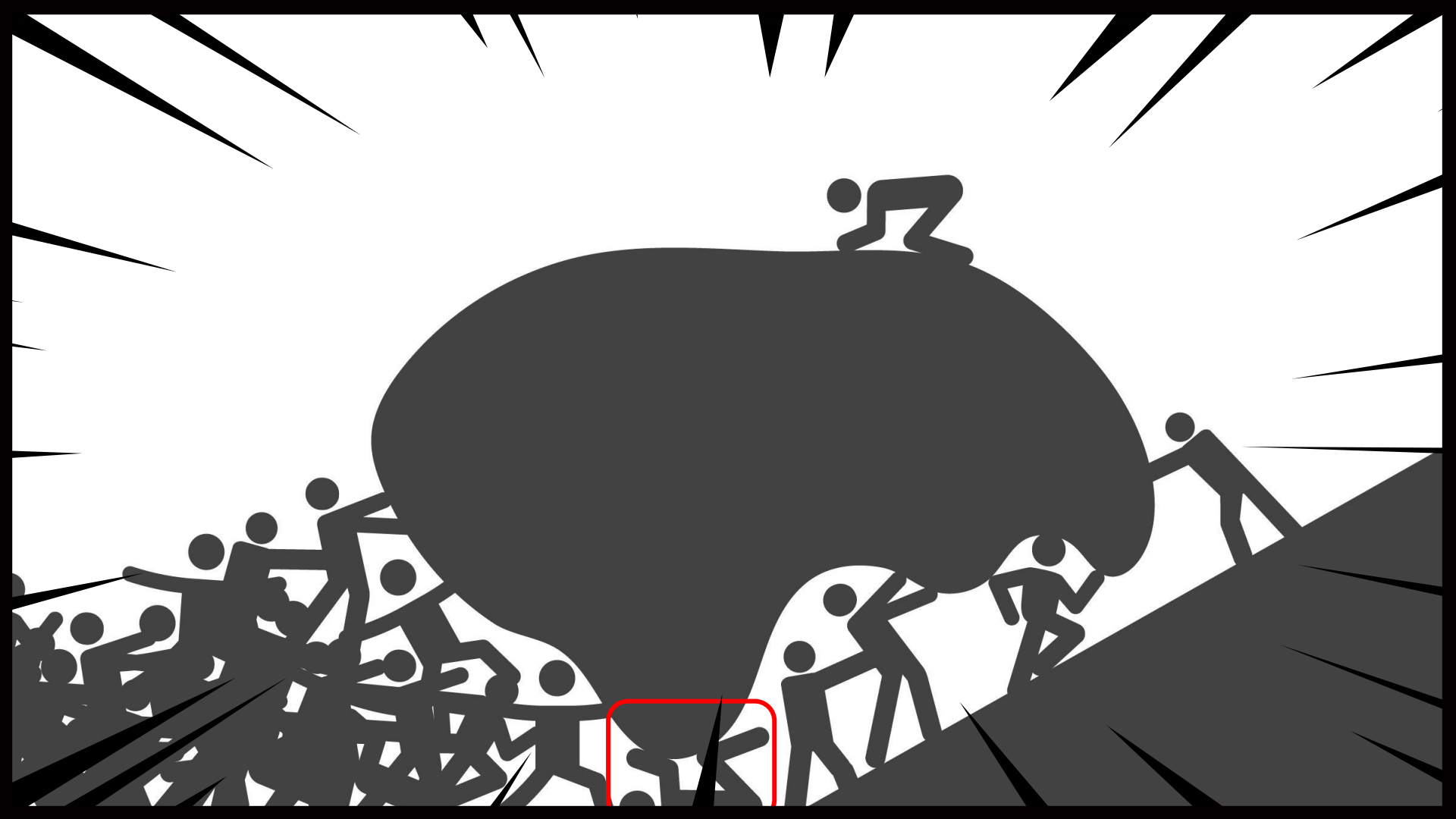
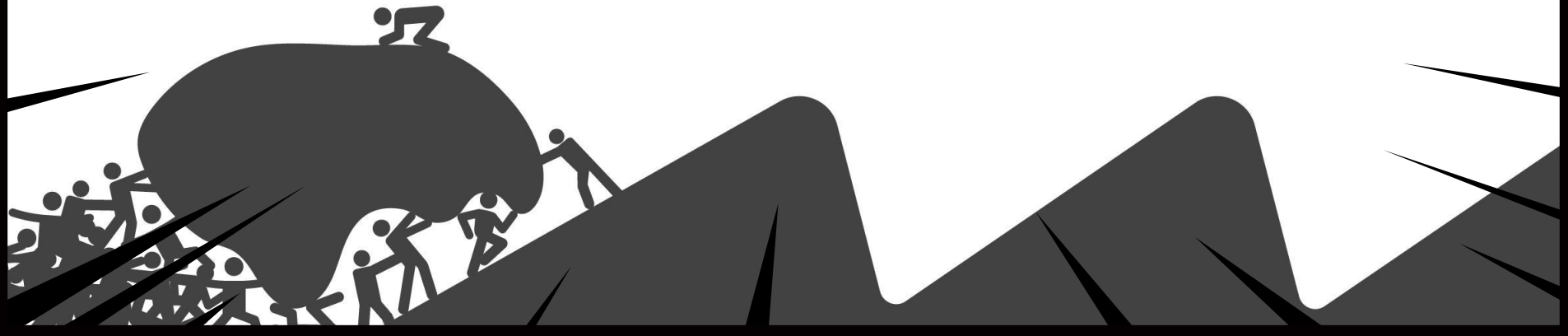
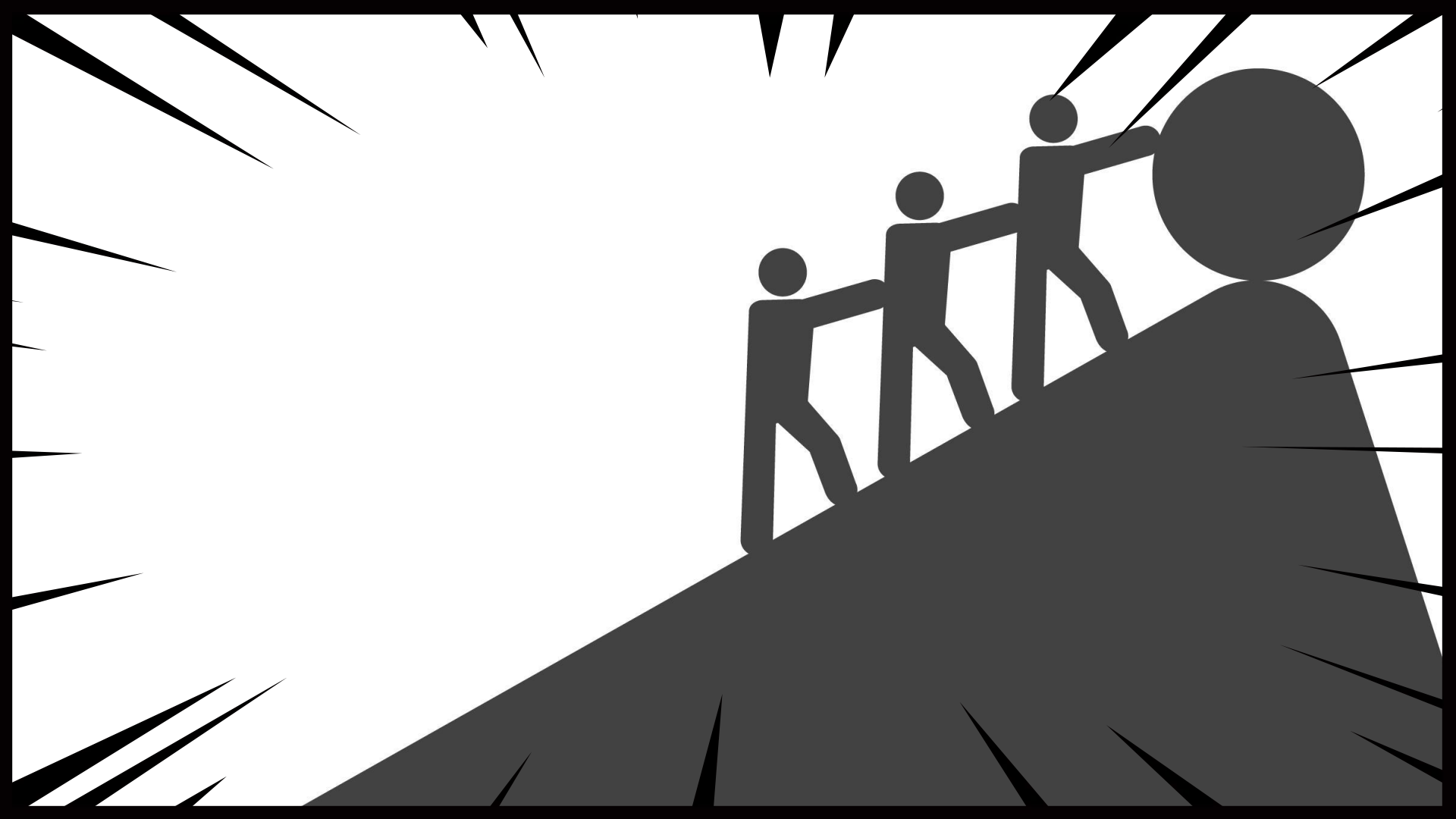


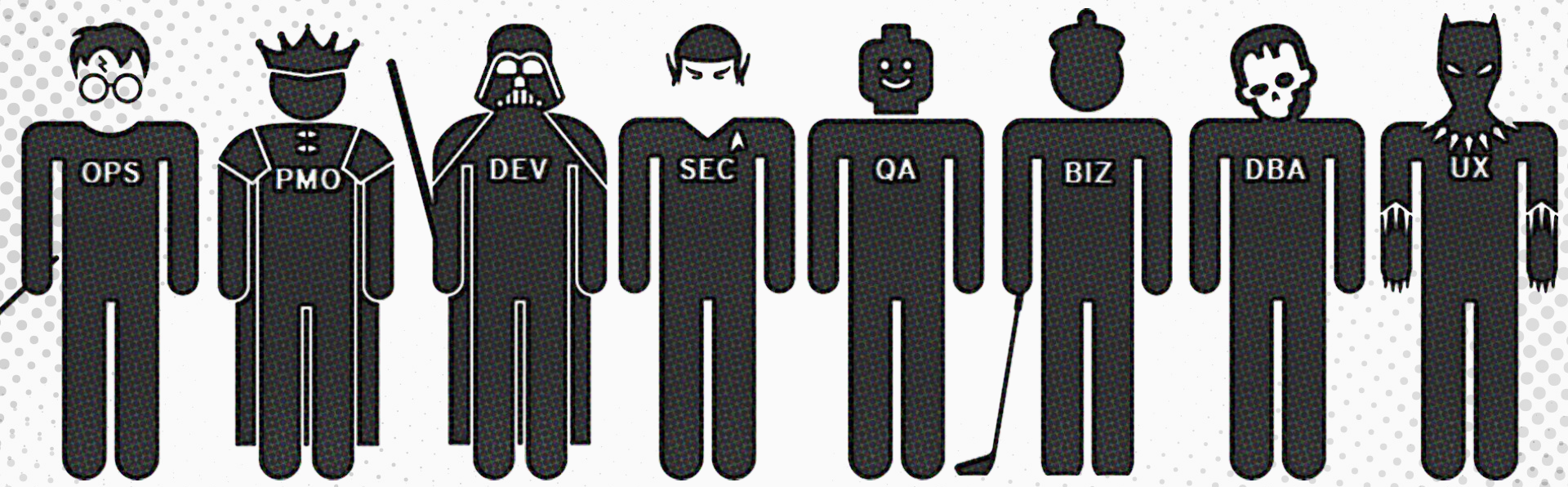








DEV
OPS
WALL OF CONFUSION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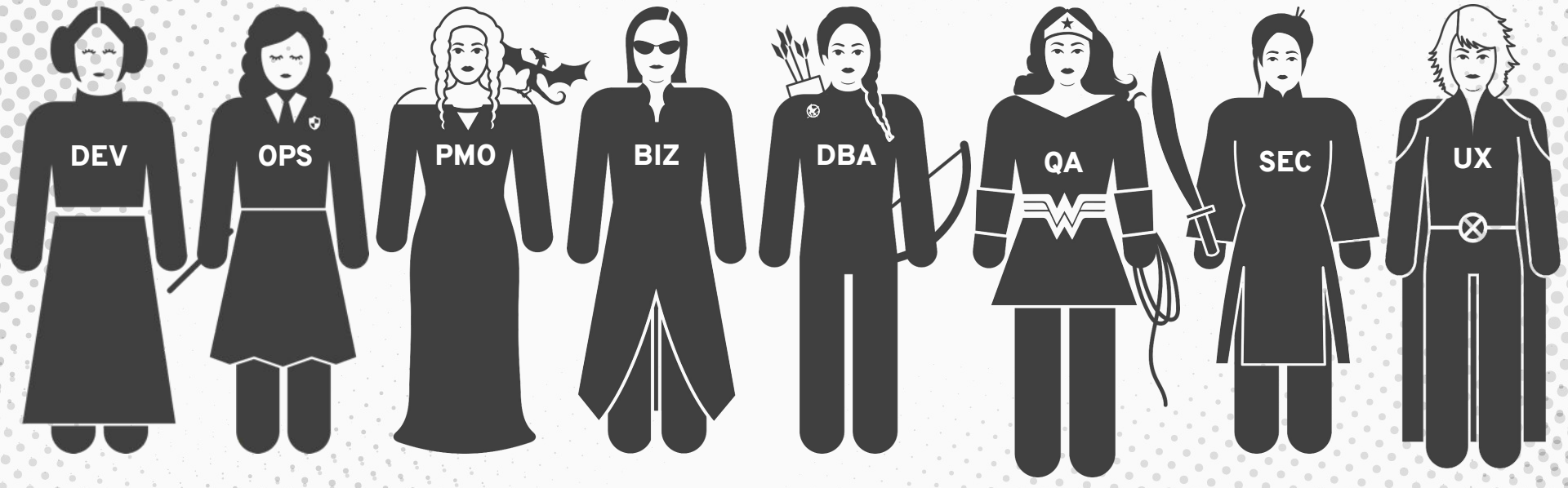
PMO
DEV
SEC
QA
BIZ
DBA
UX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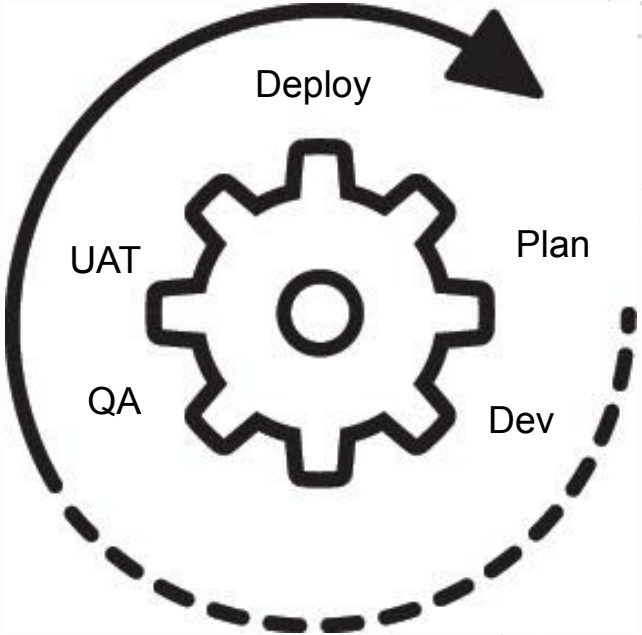
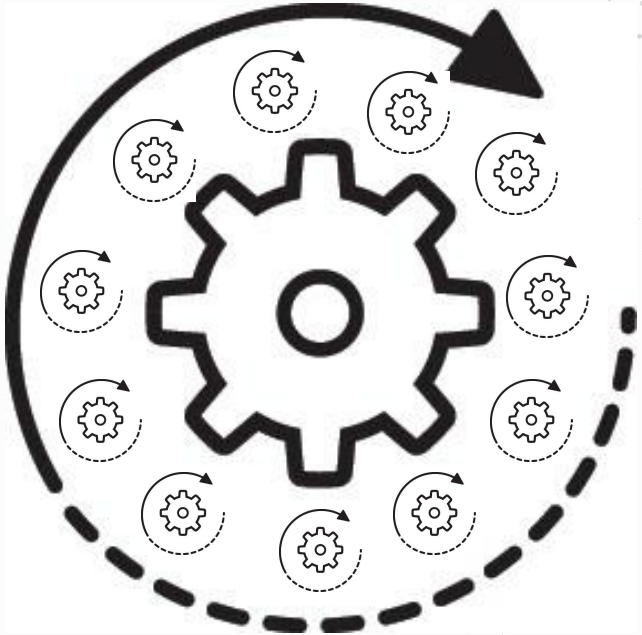
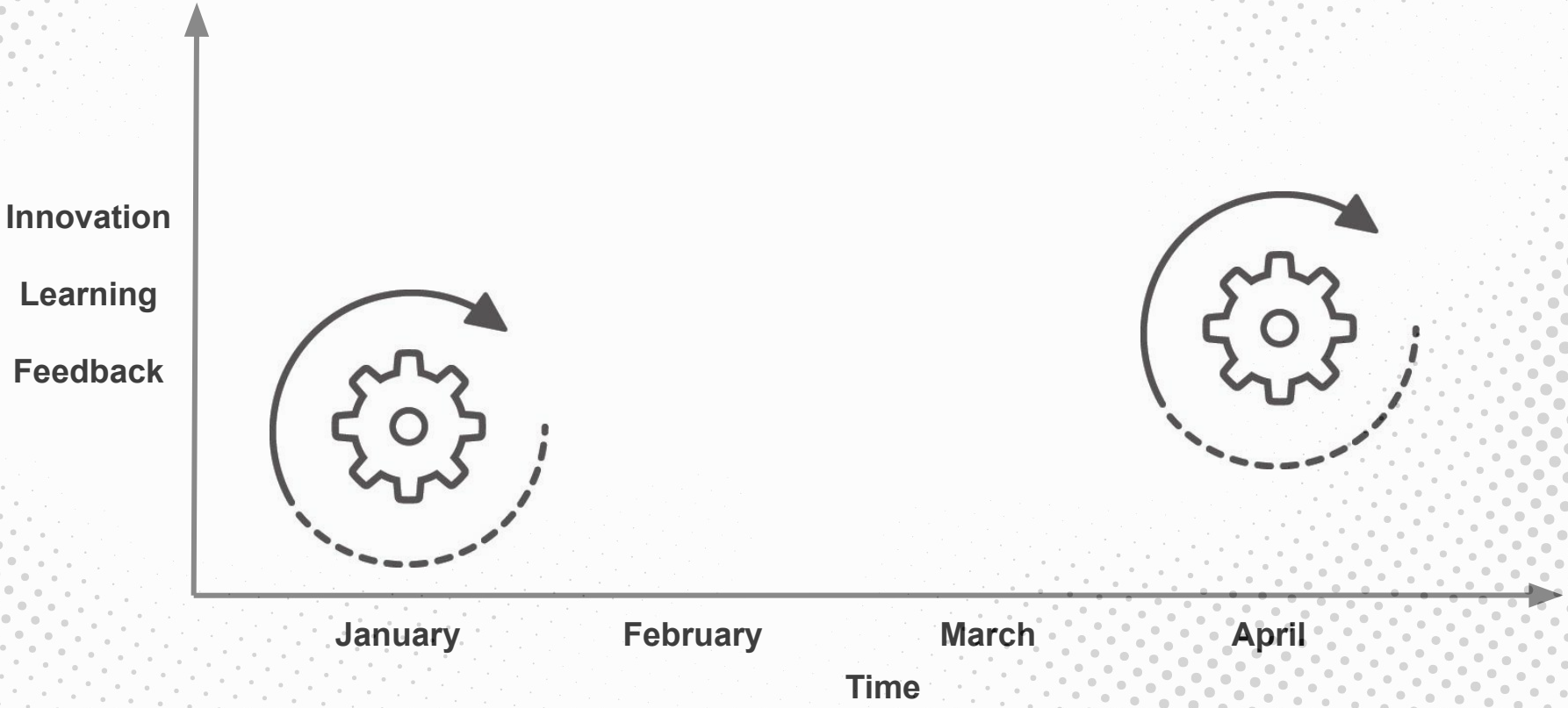


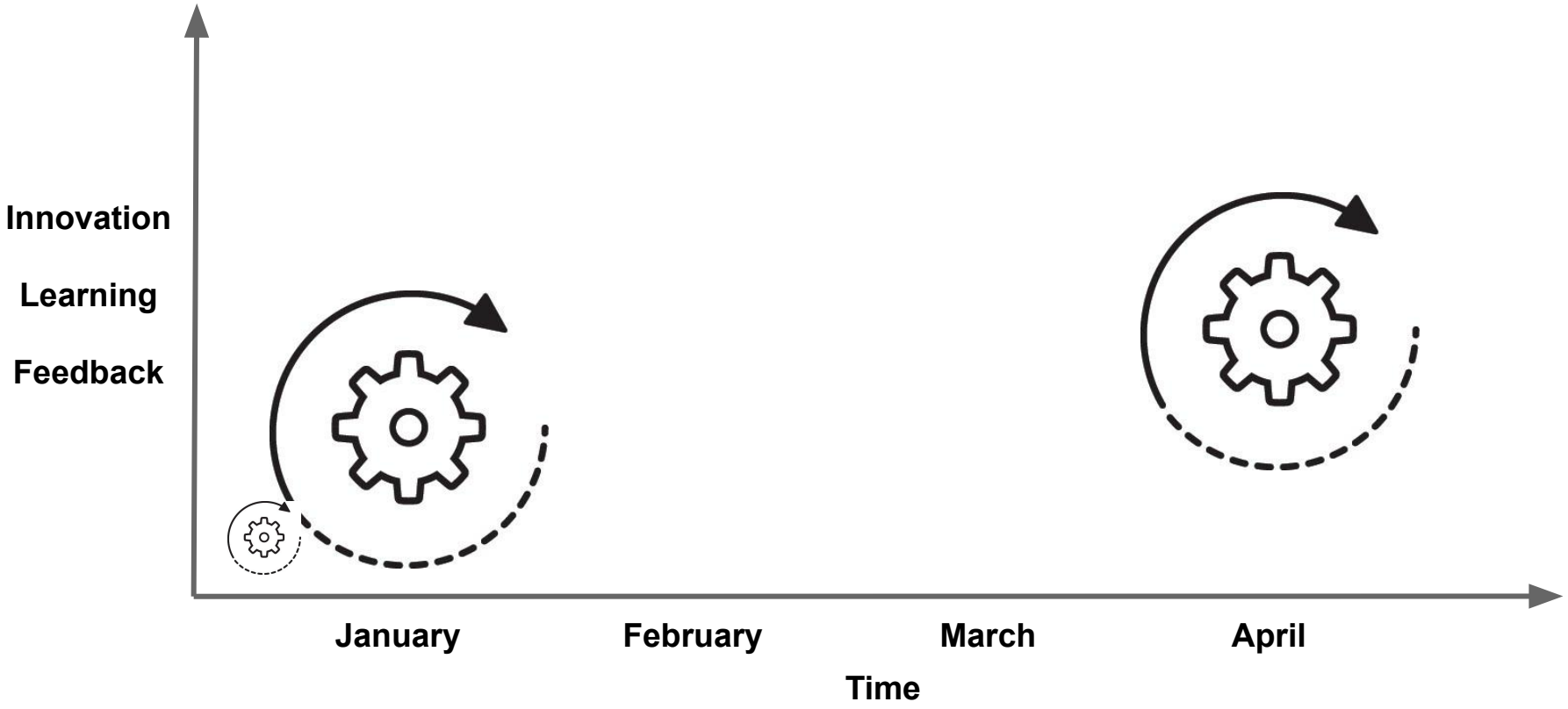
3 Month Deployment Cycle

3 Months BEFORE you gain Feedback and Learn



3 Months Versus 1 Week


Innovation
Learning
Feedback
January
February
March
April
Time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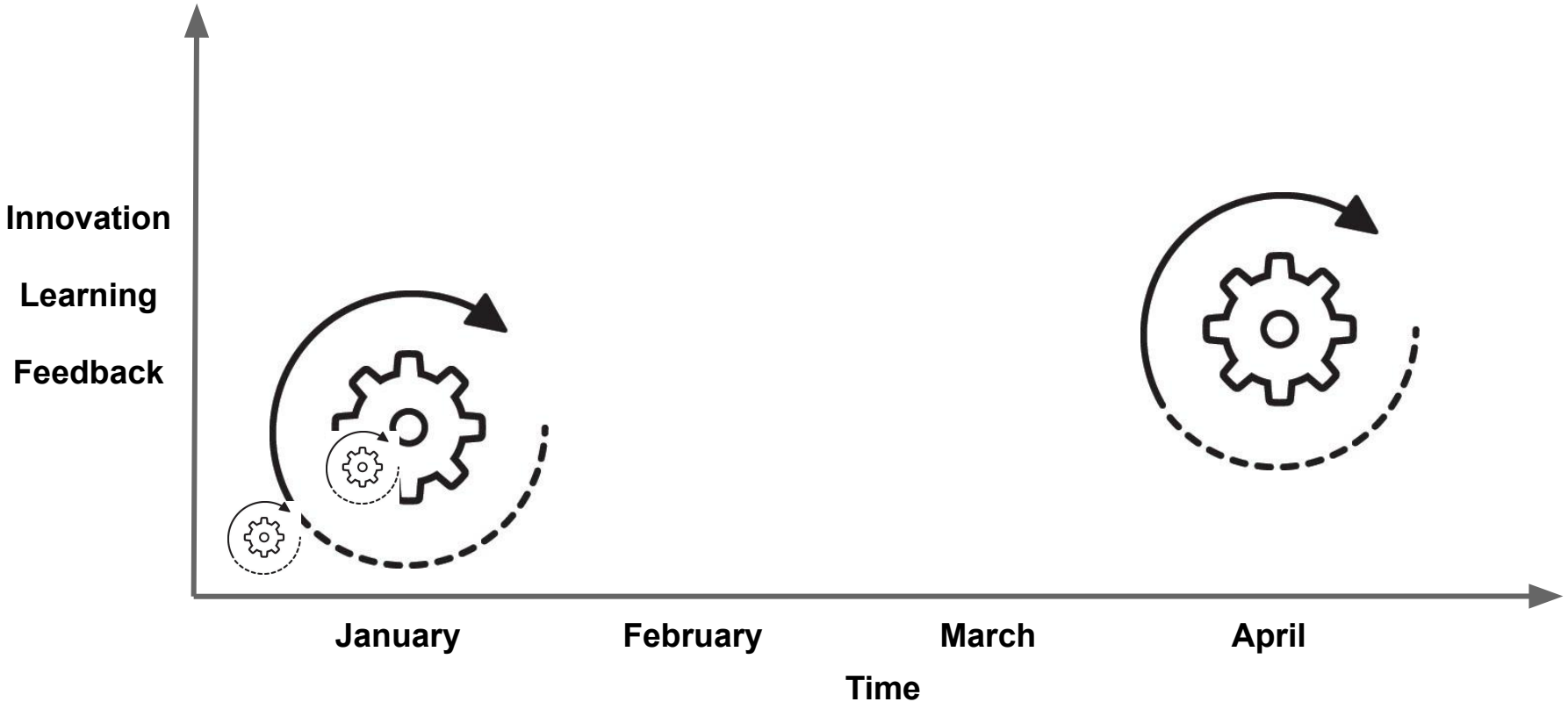
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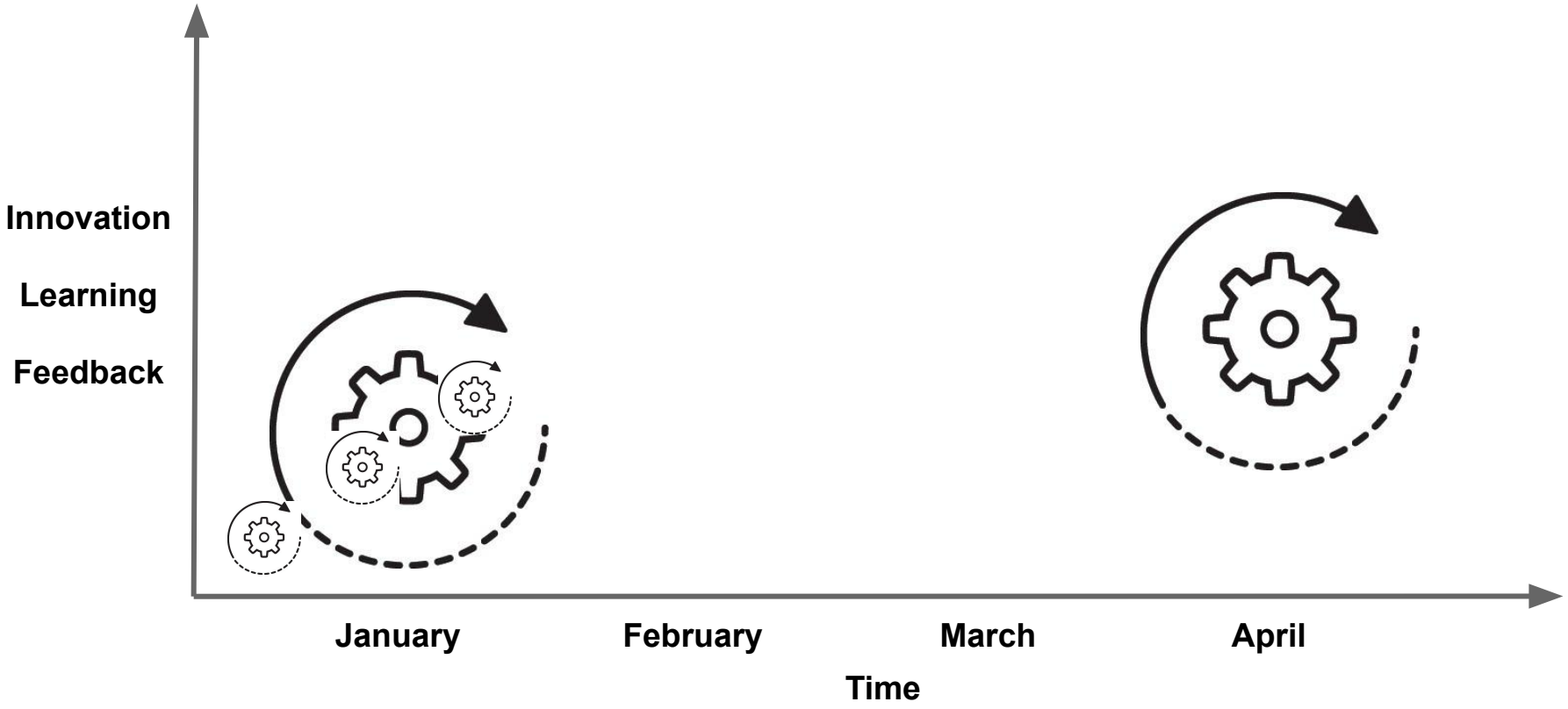
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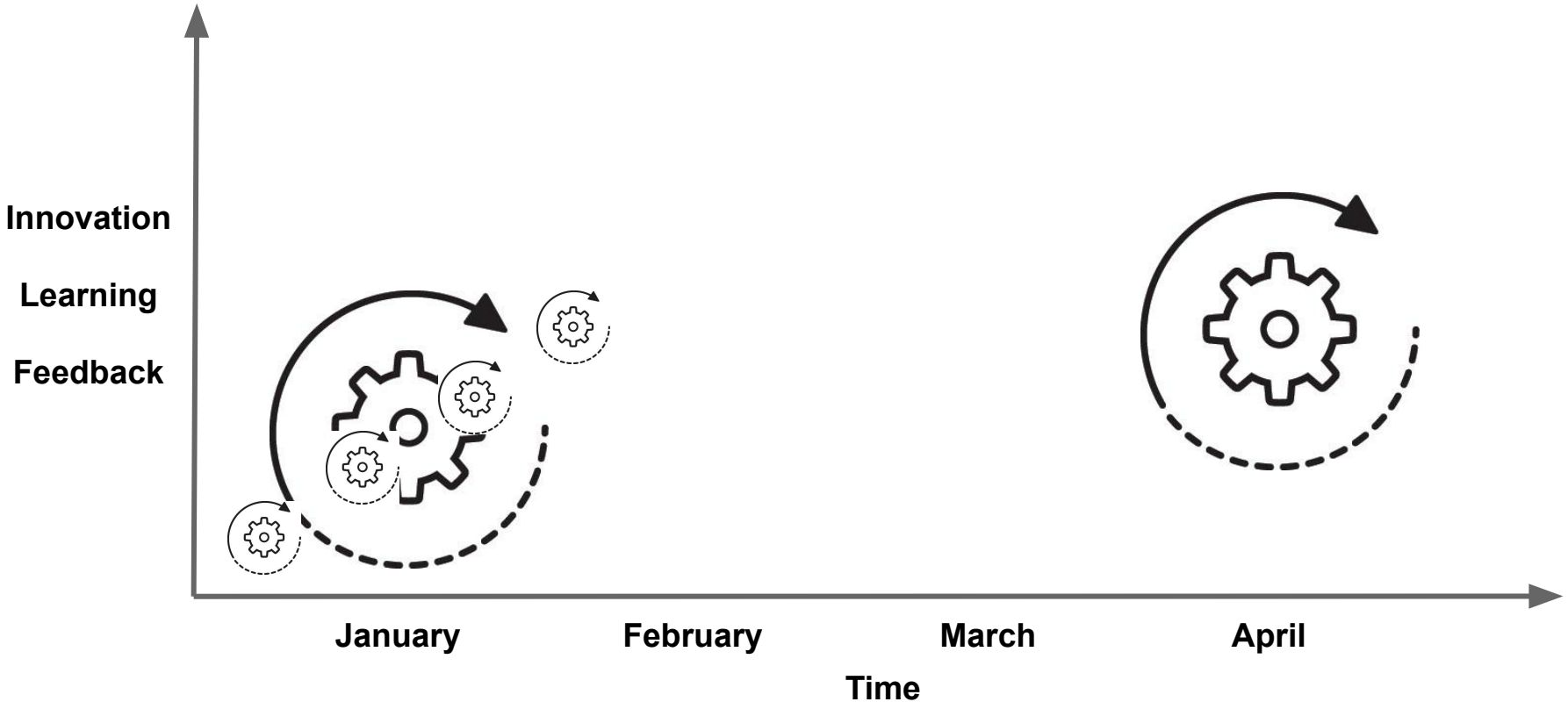
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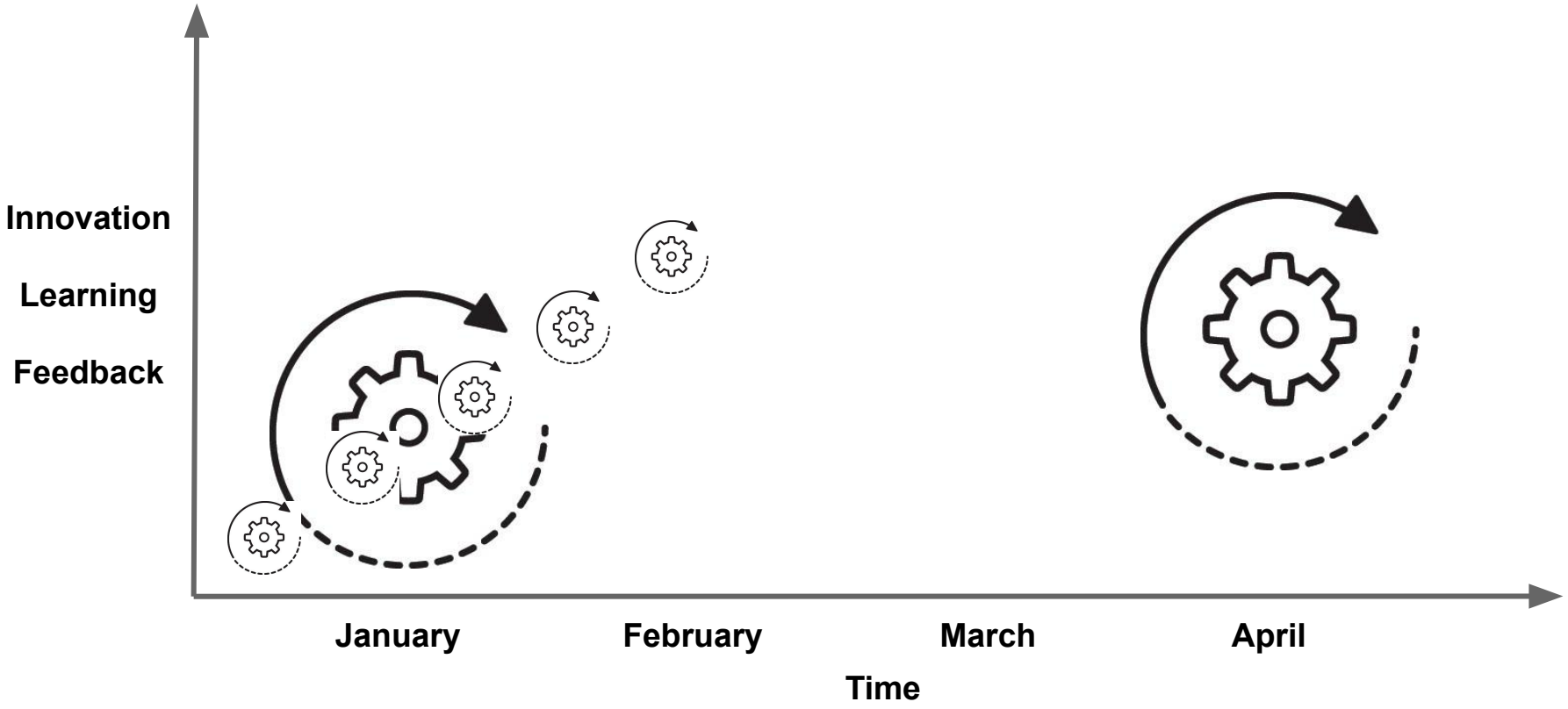
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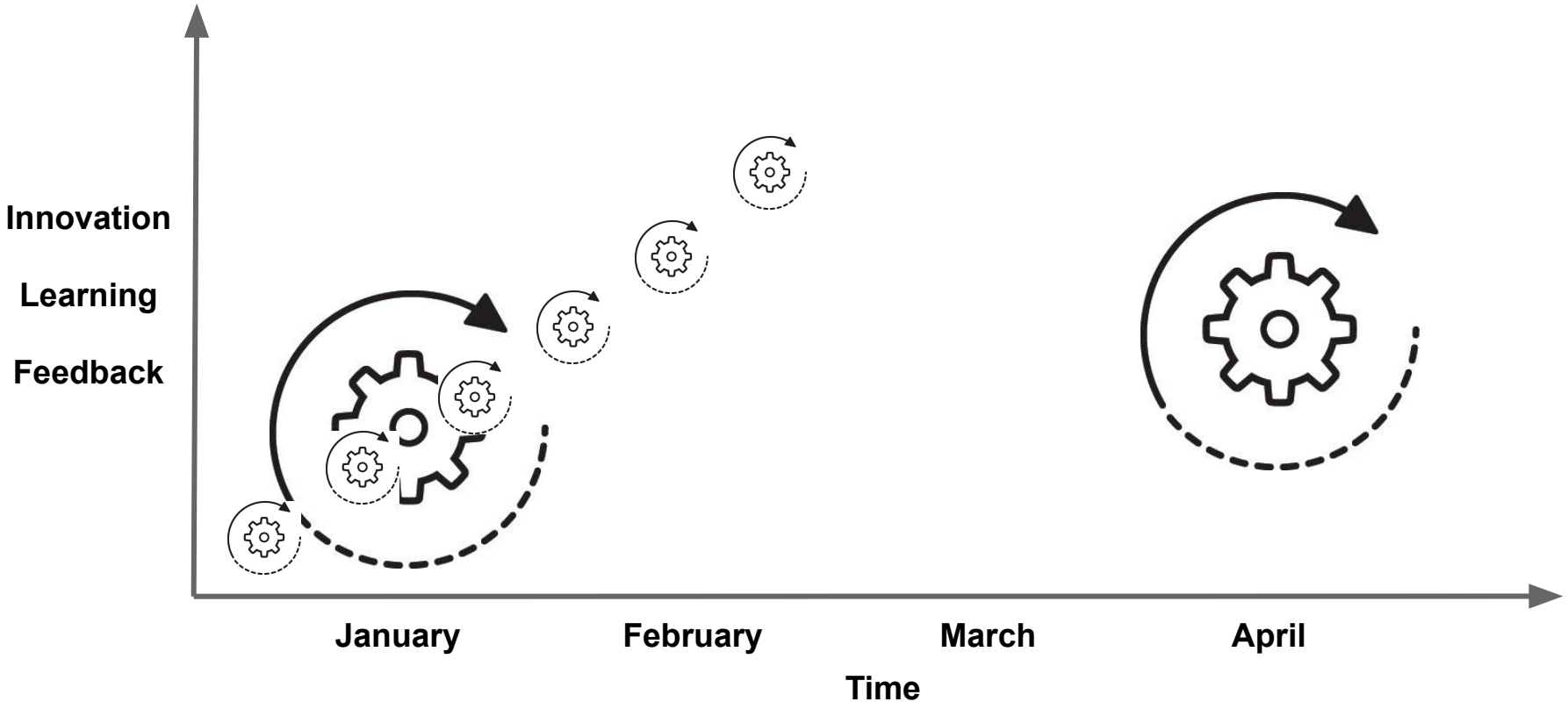
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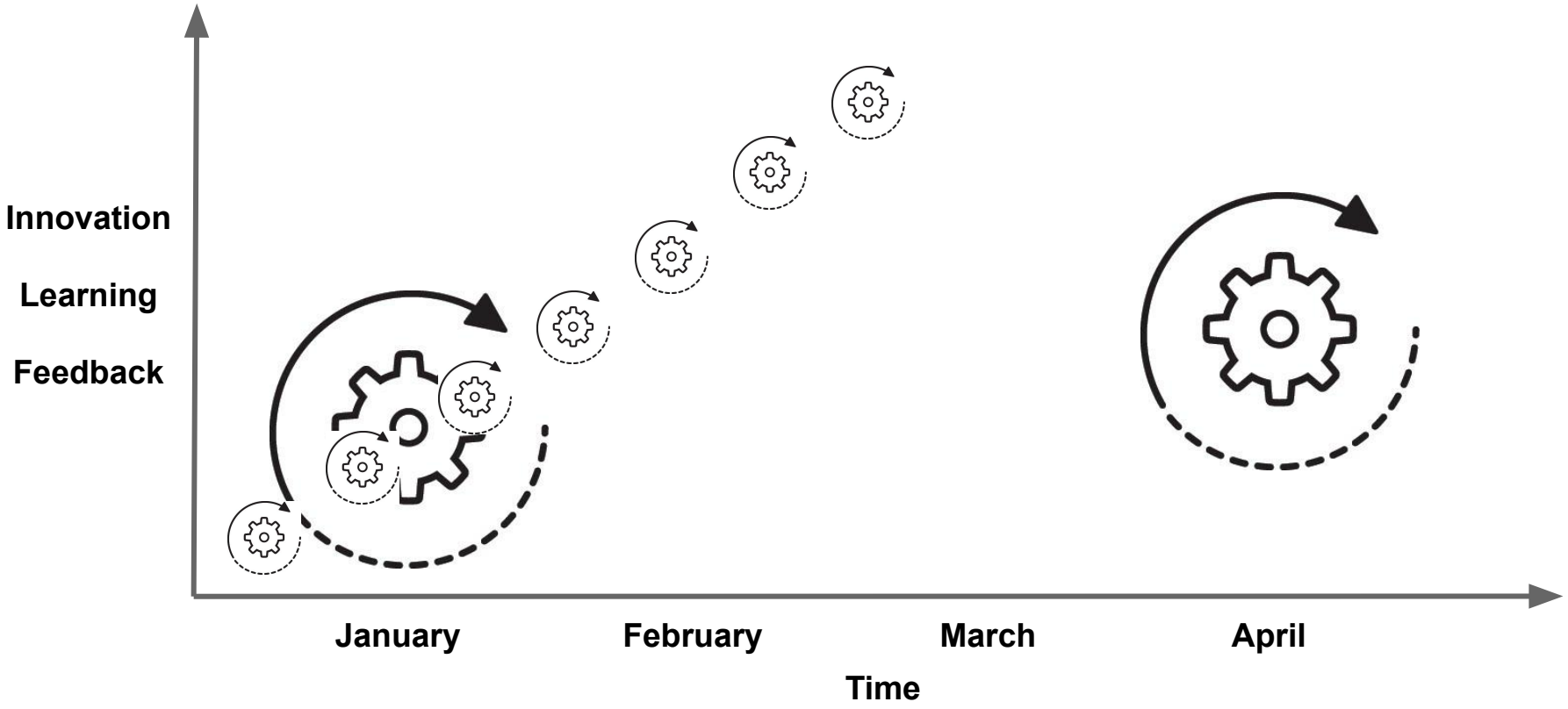
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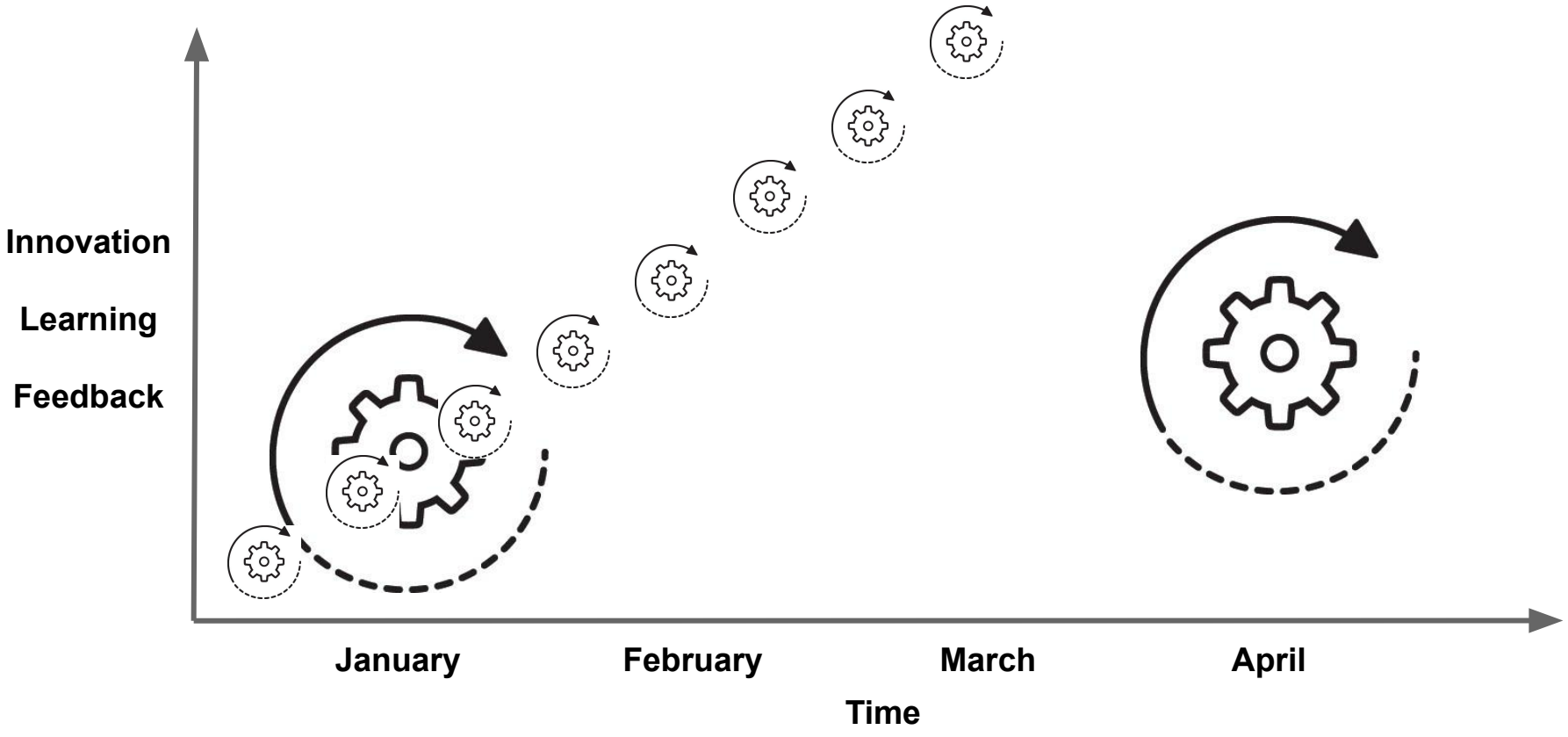
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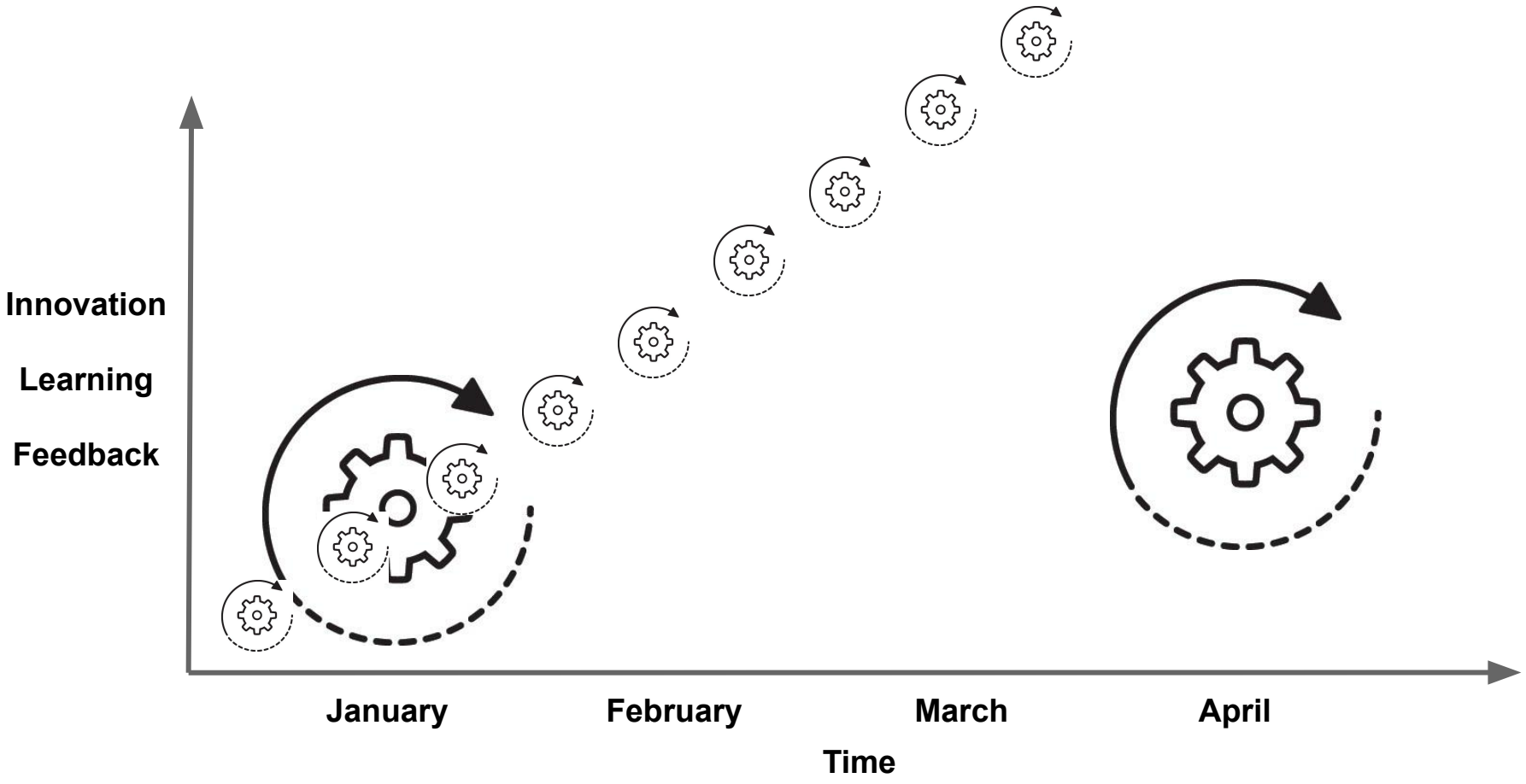
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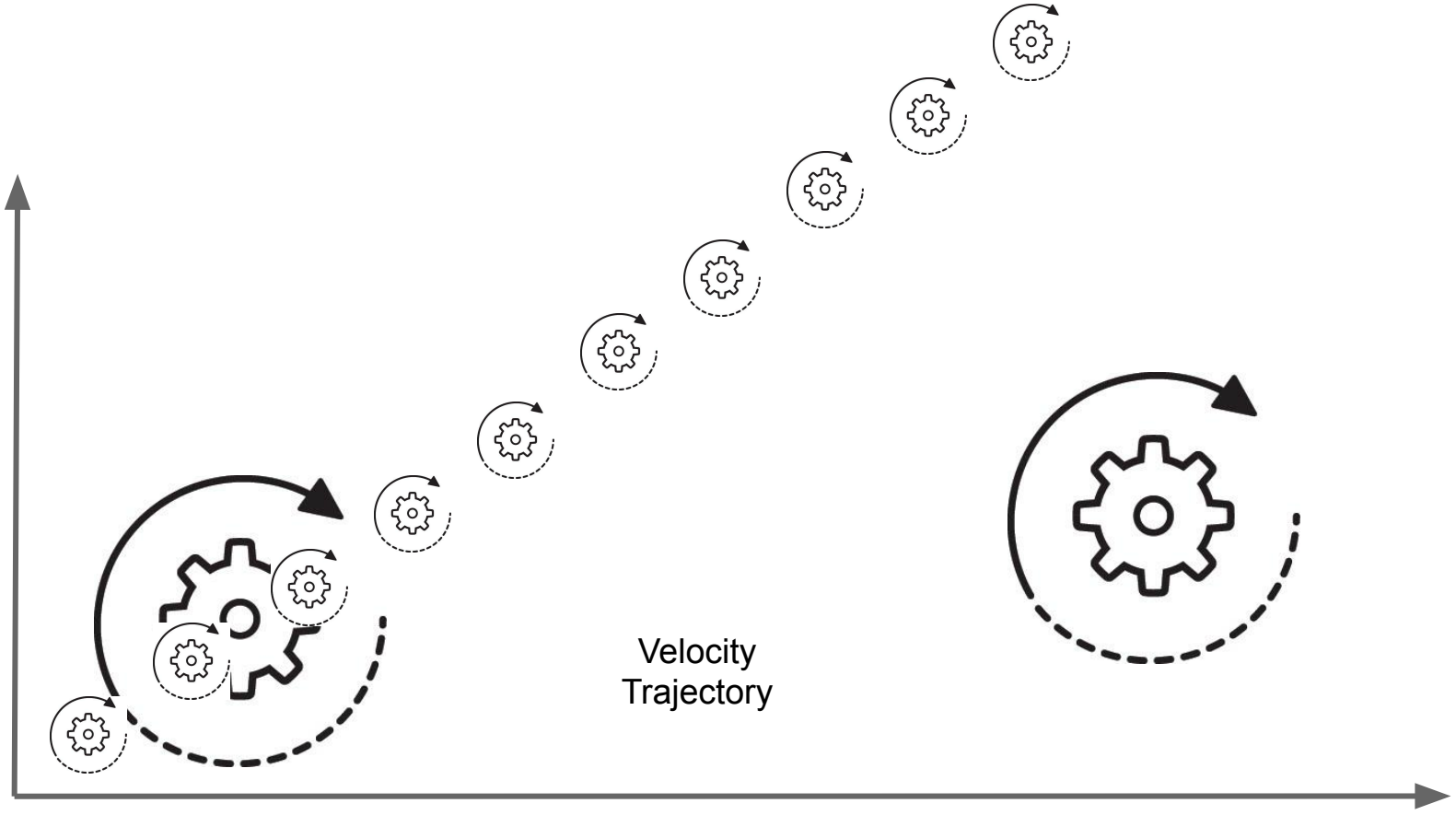
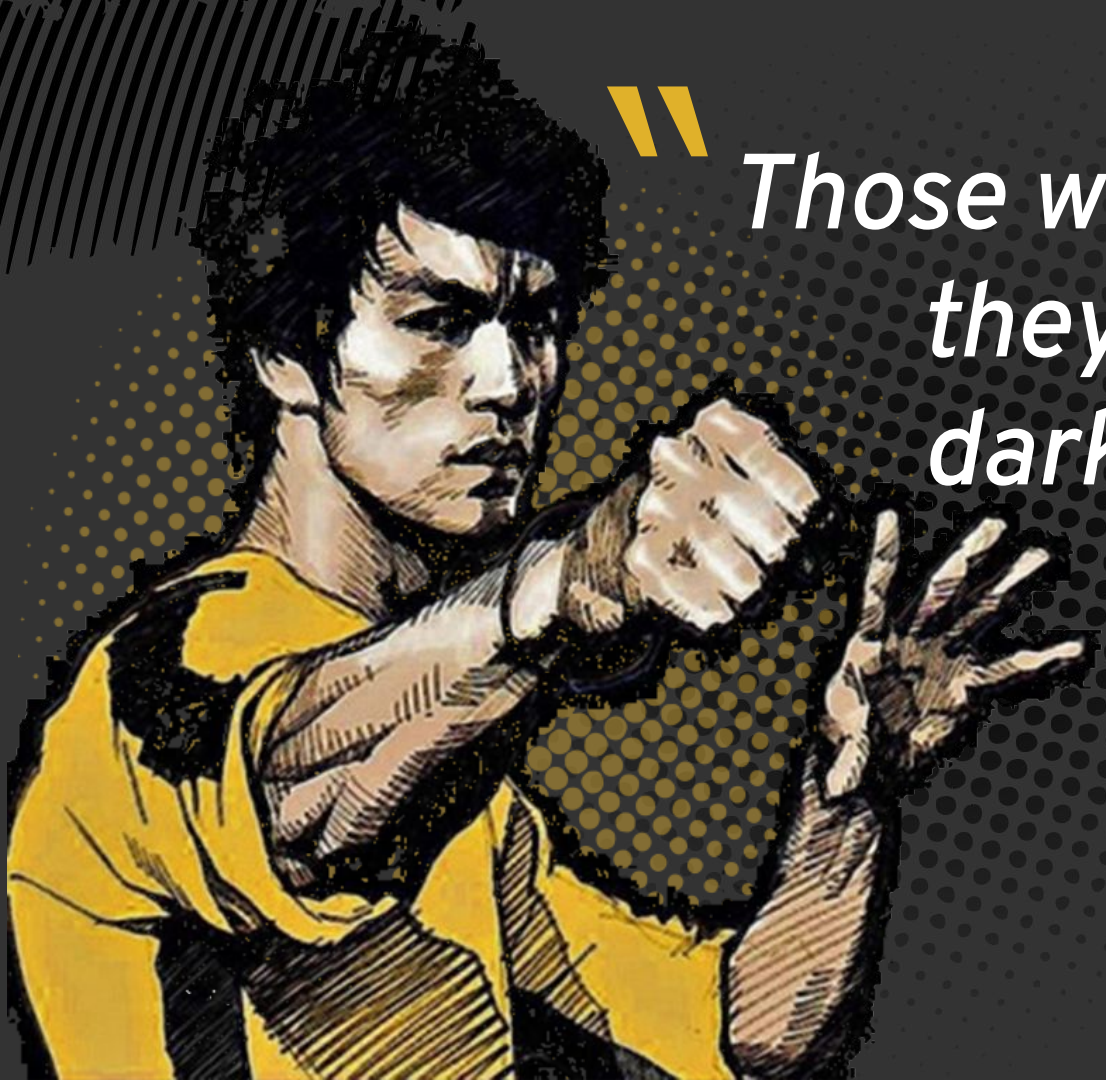

Velocity
Trajectory



Those who are unaware they are walking in darkness will never seek the light.

— *Bruce Lee*

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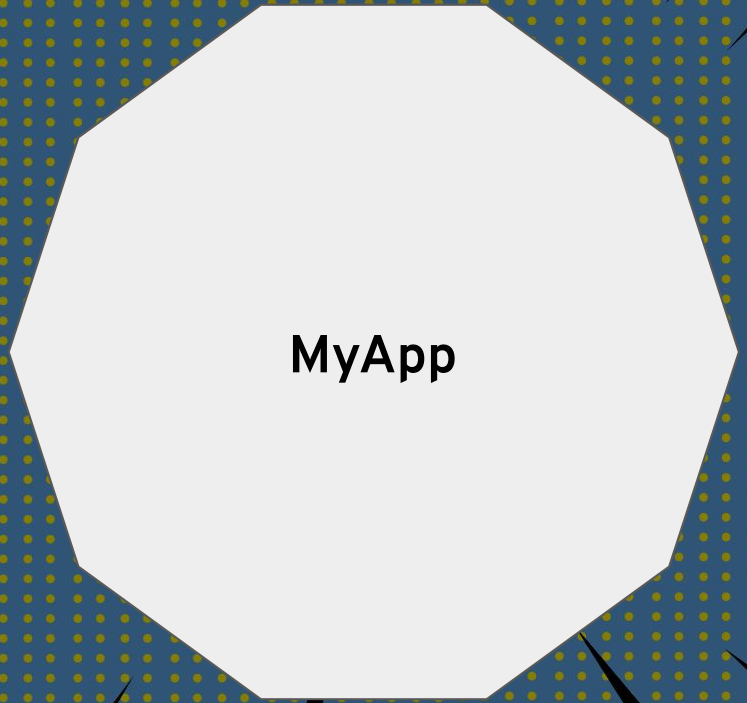
Monolith



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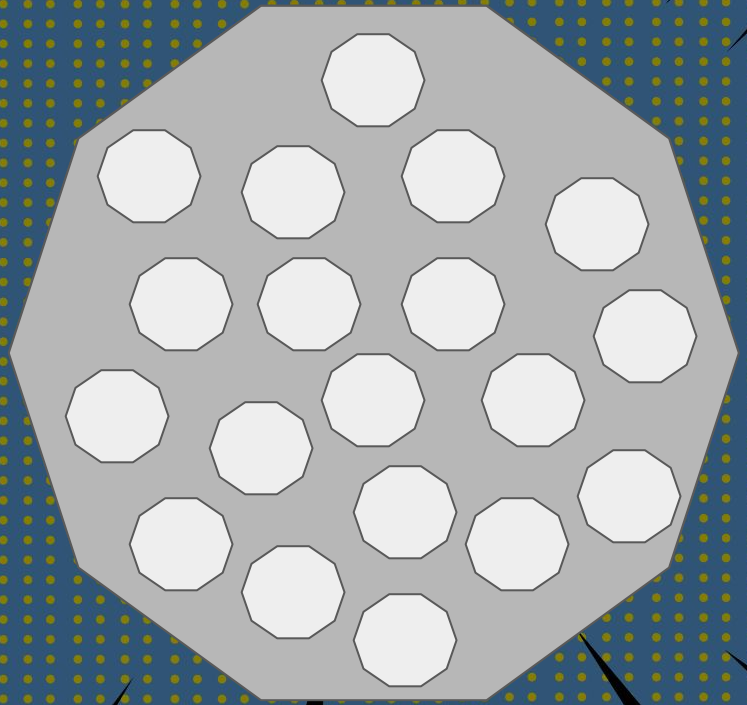
The Application



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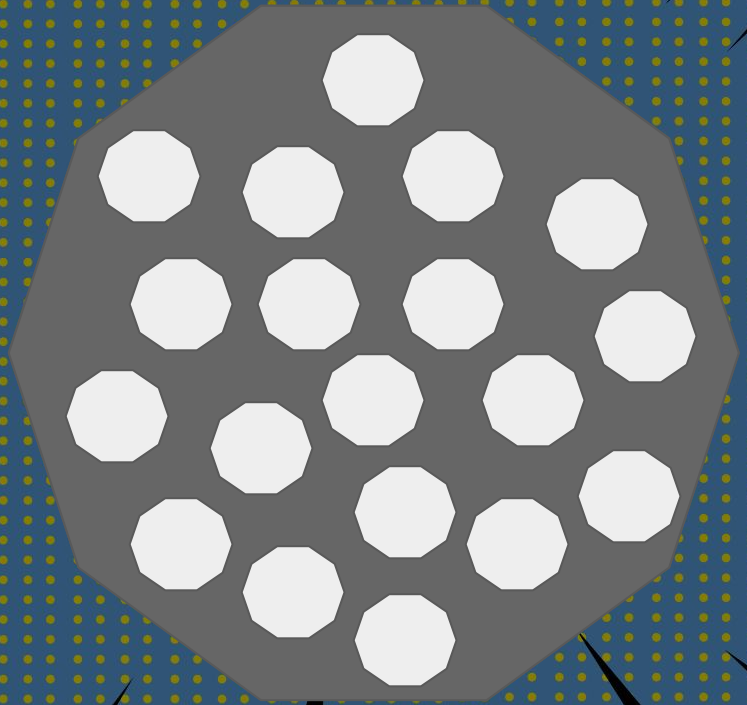
Modules



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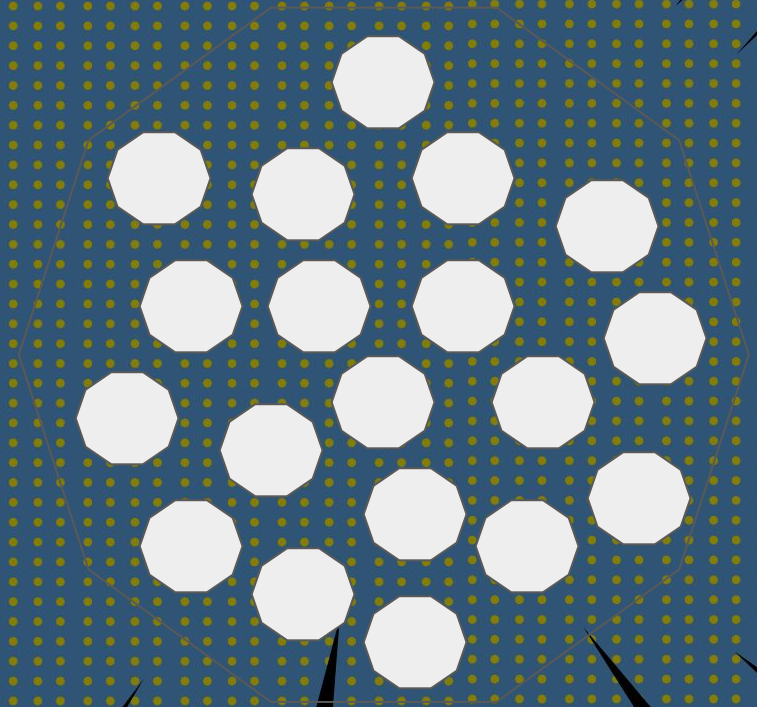
Microservices



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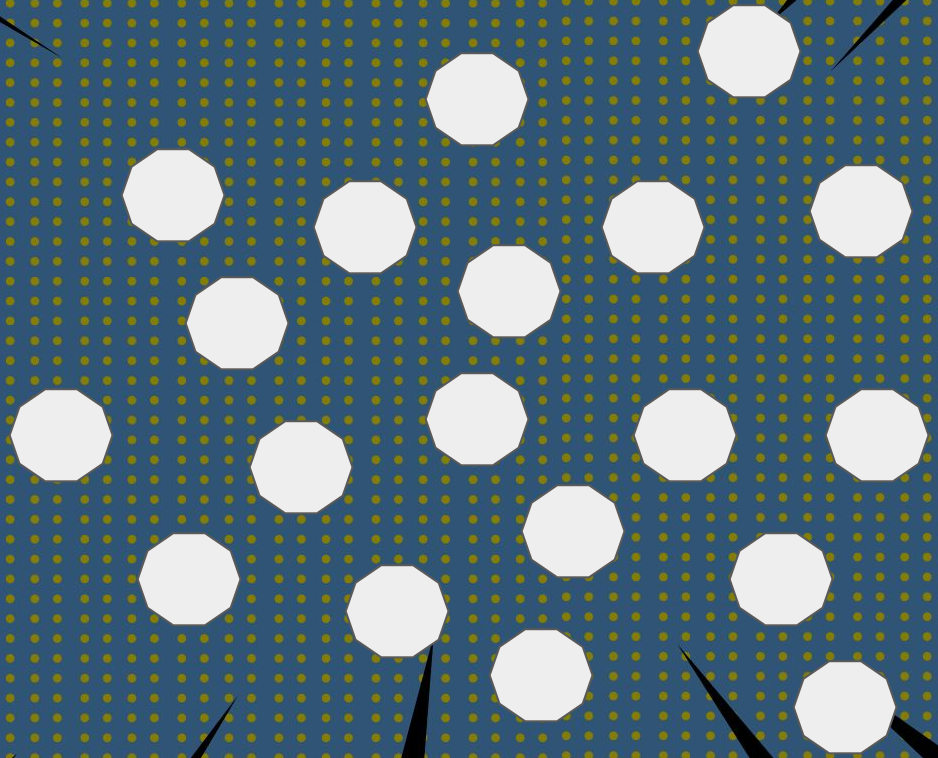
Microservices



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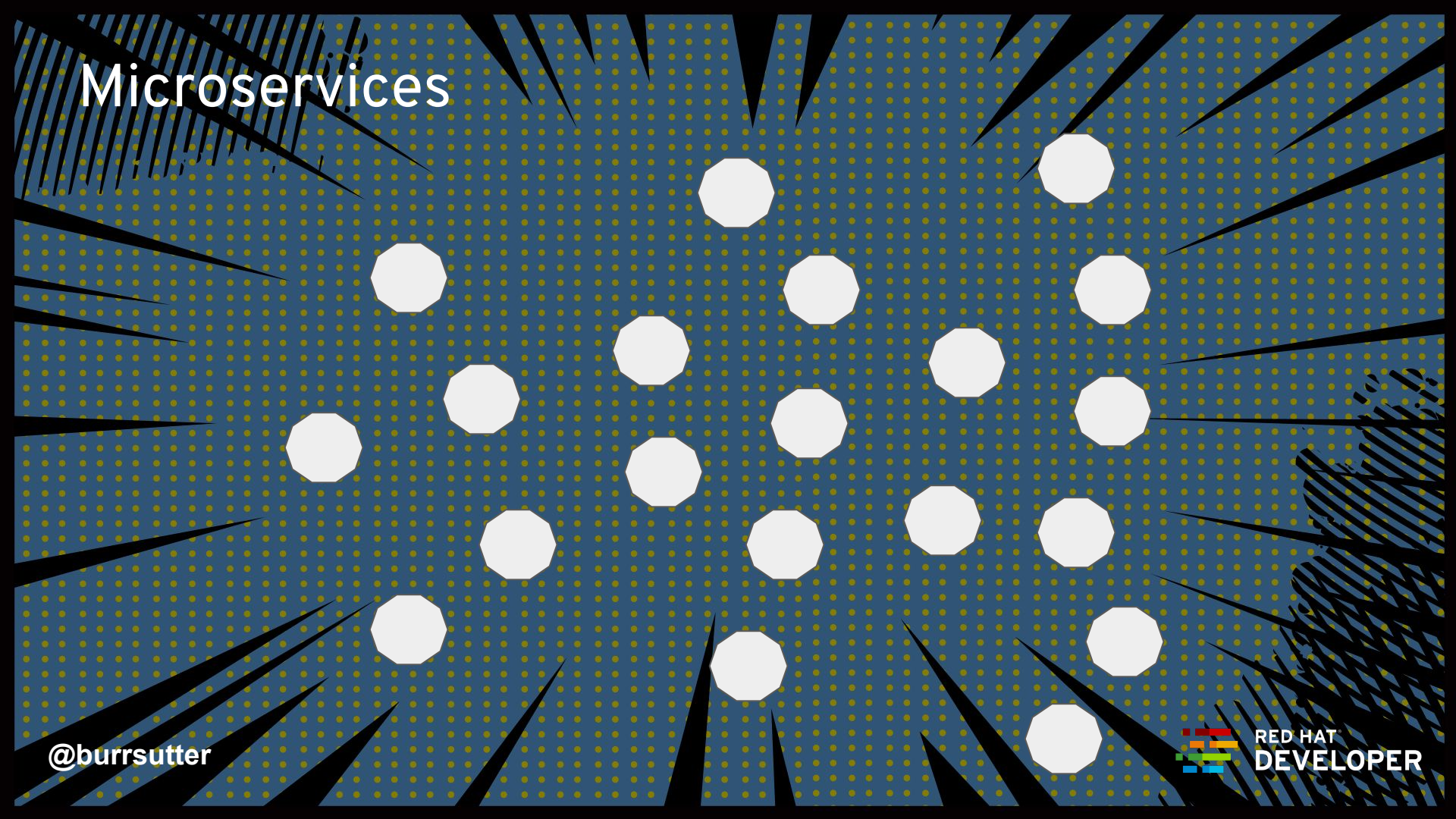
Microservices



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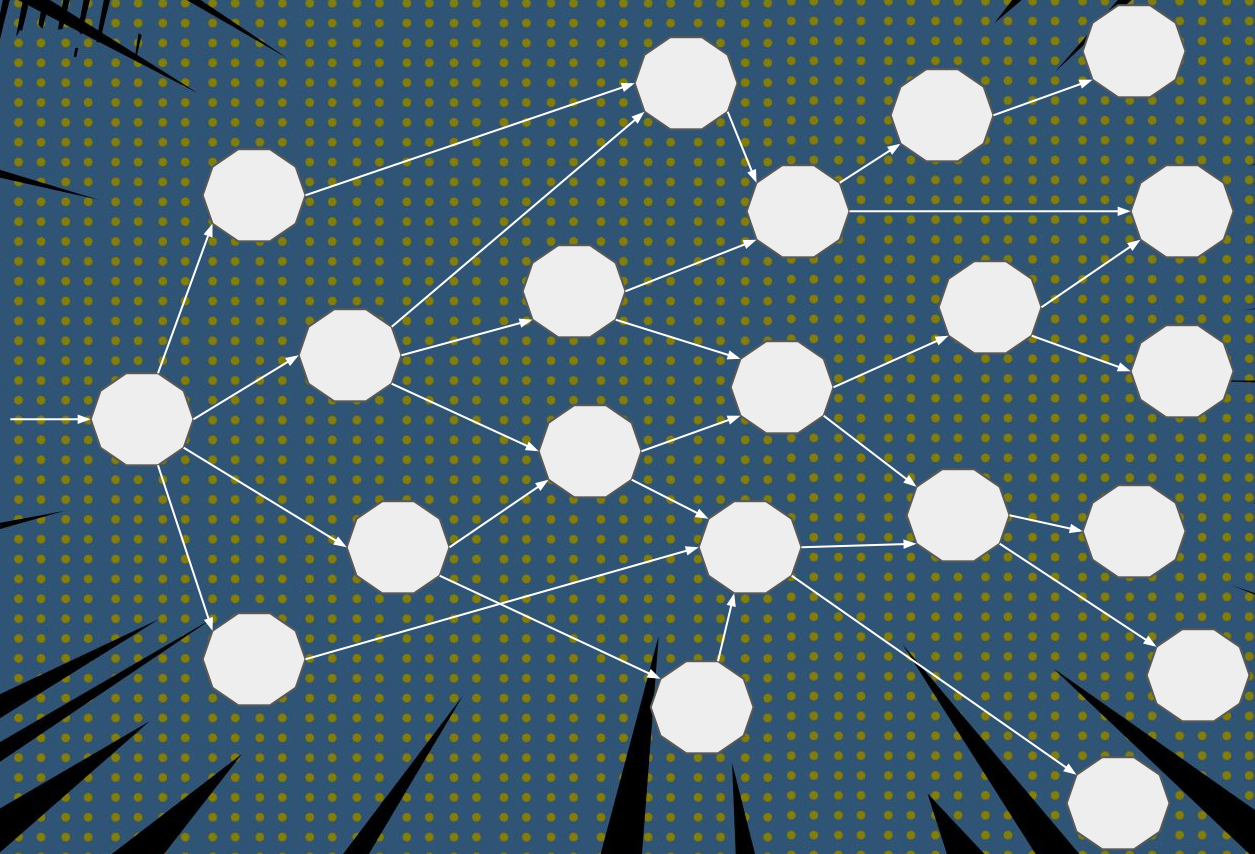
Network of Services



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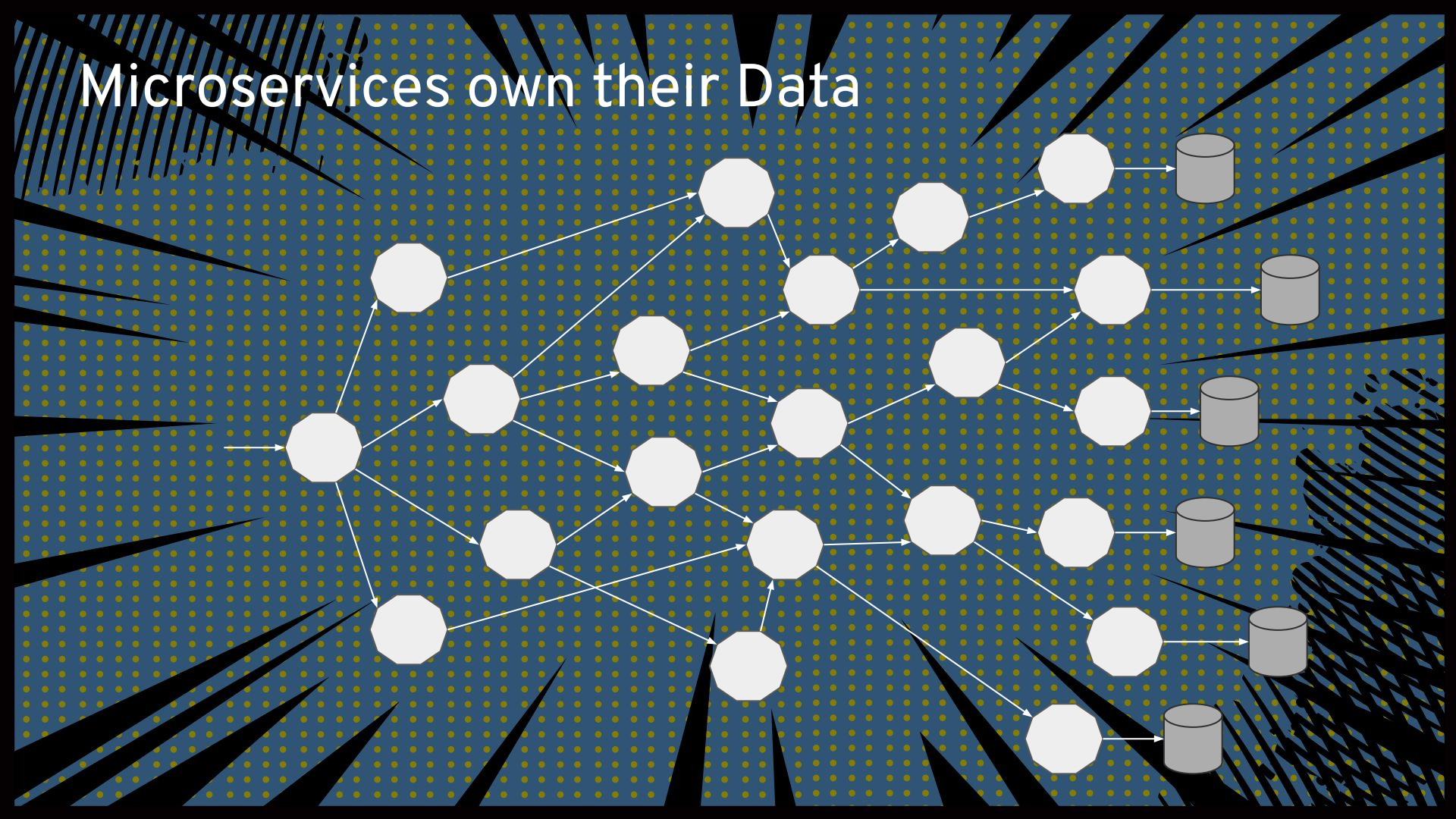
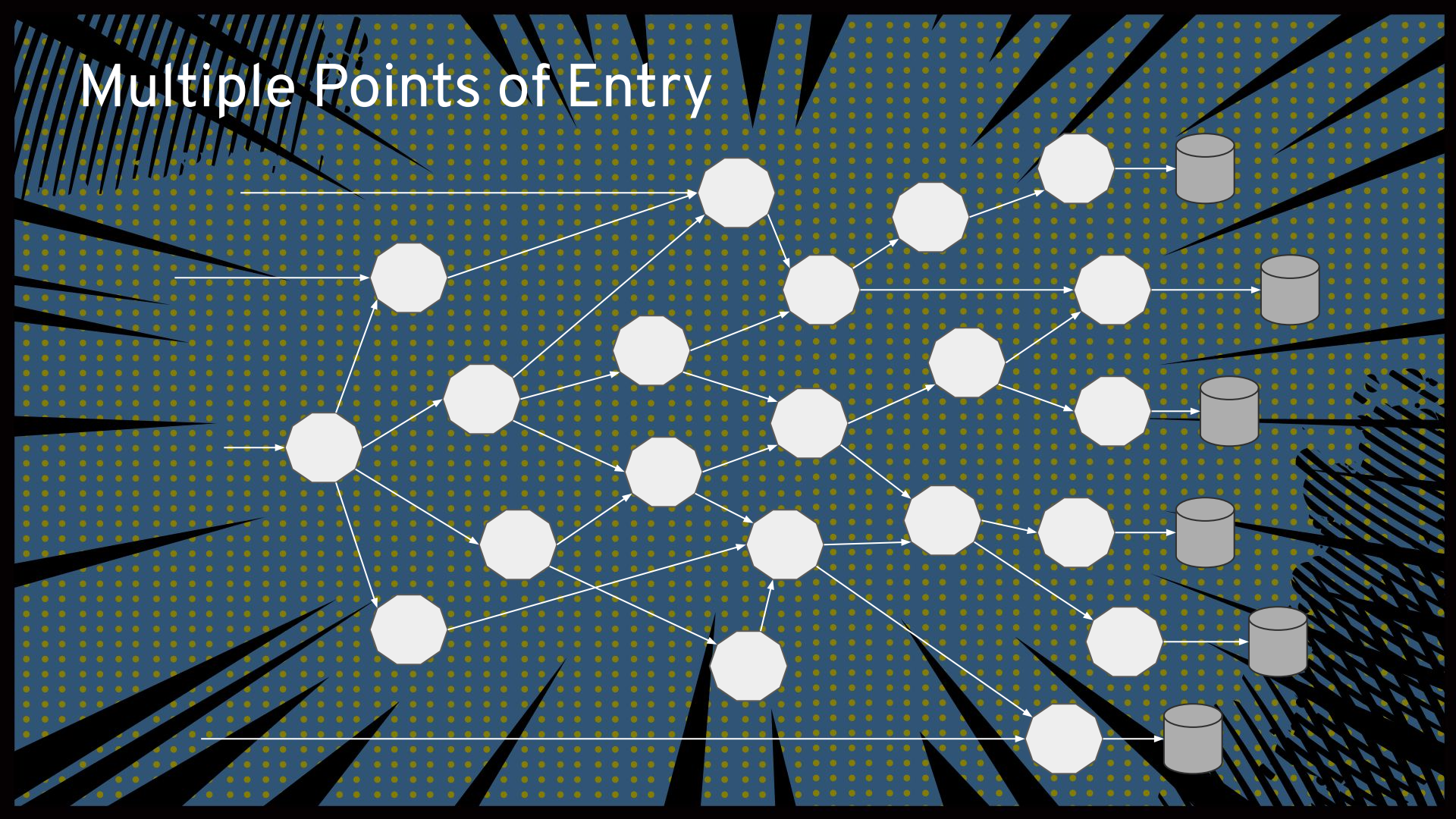
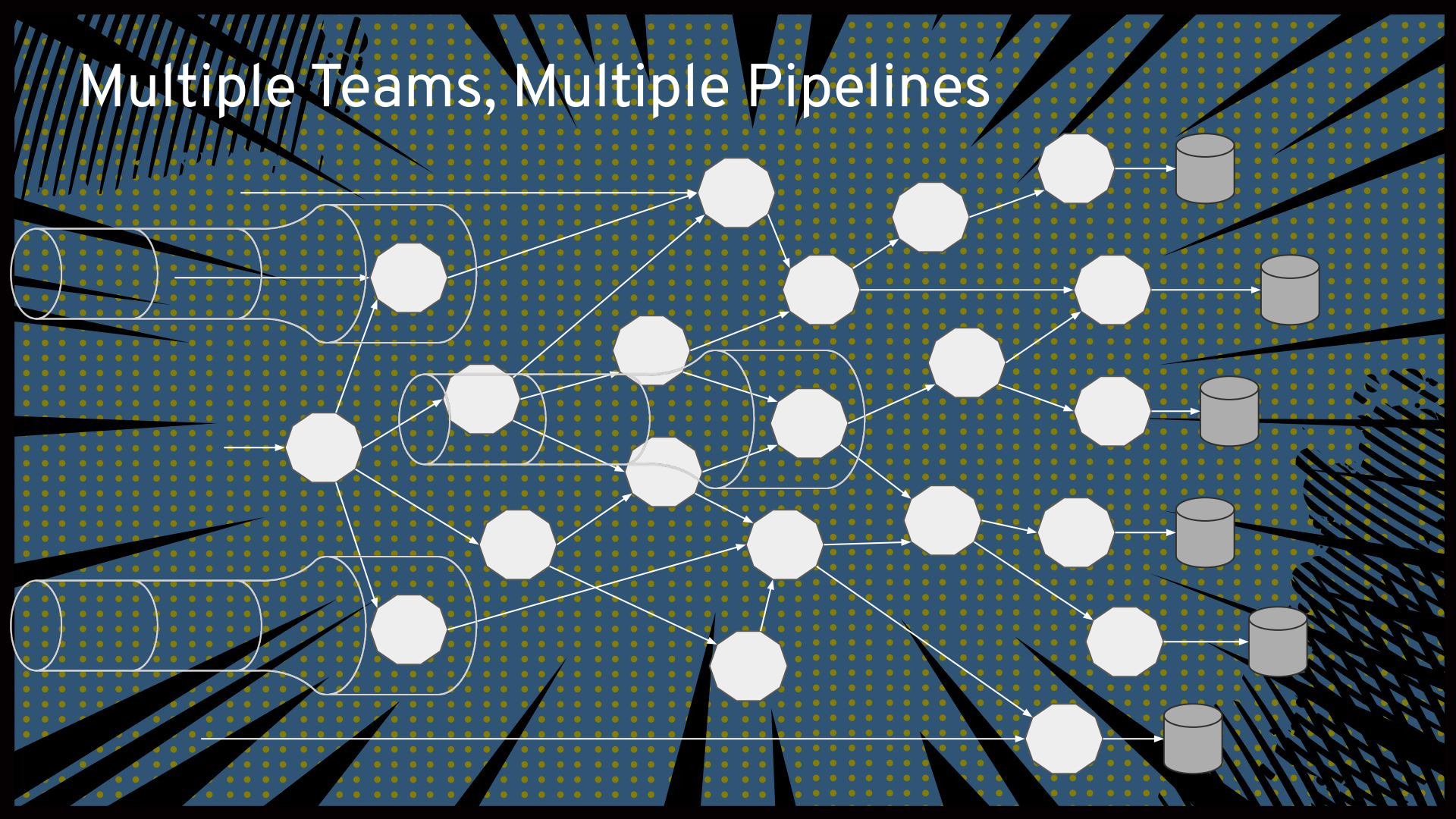
Microservices own their Data



Multiple Points of Entry

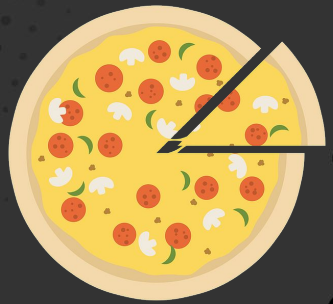


Multiple Teams, Multiple Pipelines



Microservices Principles

1. Deployment **Independence** - updates to an individual microservice have no negative impact to any other component of the system. Optimized for **Replacement**
2. Organized around **business** capabilities
3. **Products** not Projects
4. **API** Focused
5. **Smart** endpoints and dumb pipes
6. Decentralized Governance
7. Decentralized Data Management
8. Infrastructure Automation (infrastructure as code)
9. Design for failure
10. Evolutionary Design



2 Pizza Team

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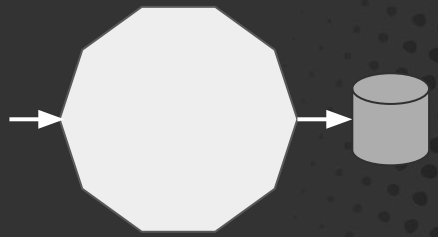
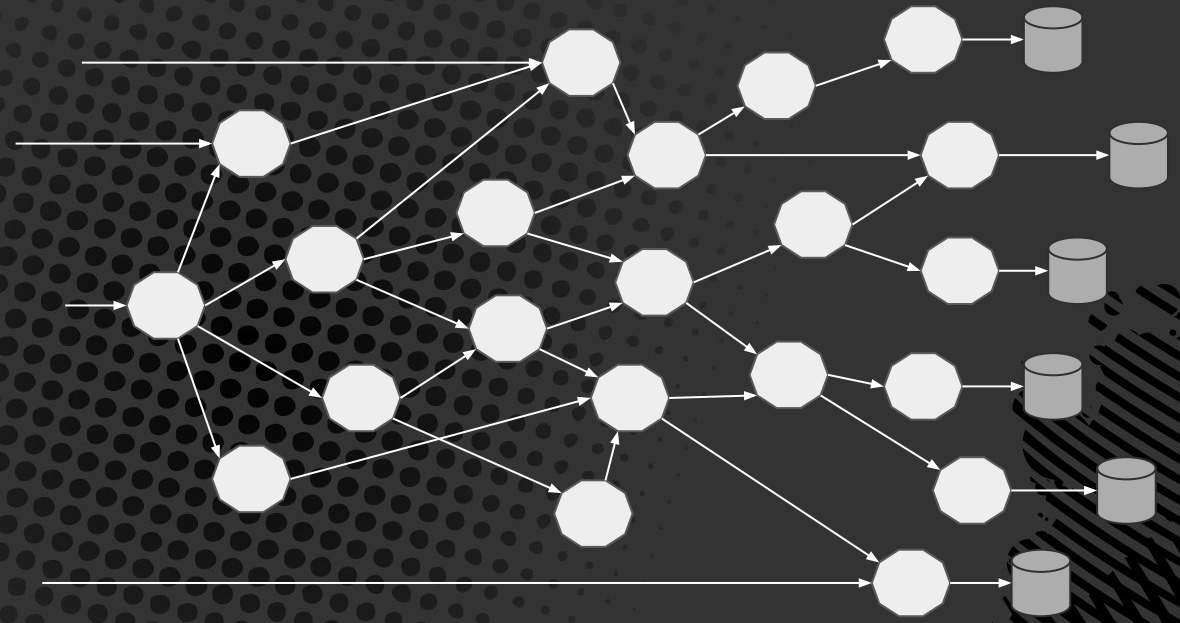
Old School

New School



Love Thy Mono



OPENSHIFT

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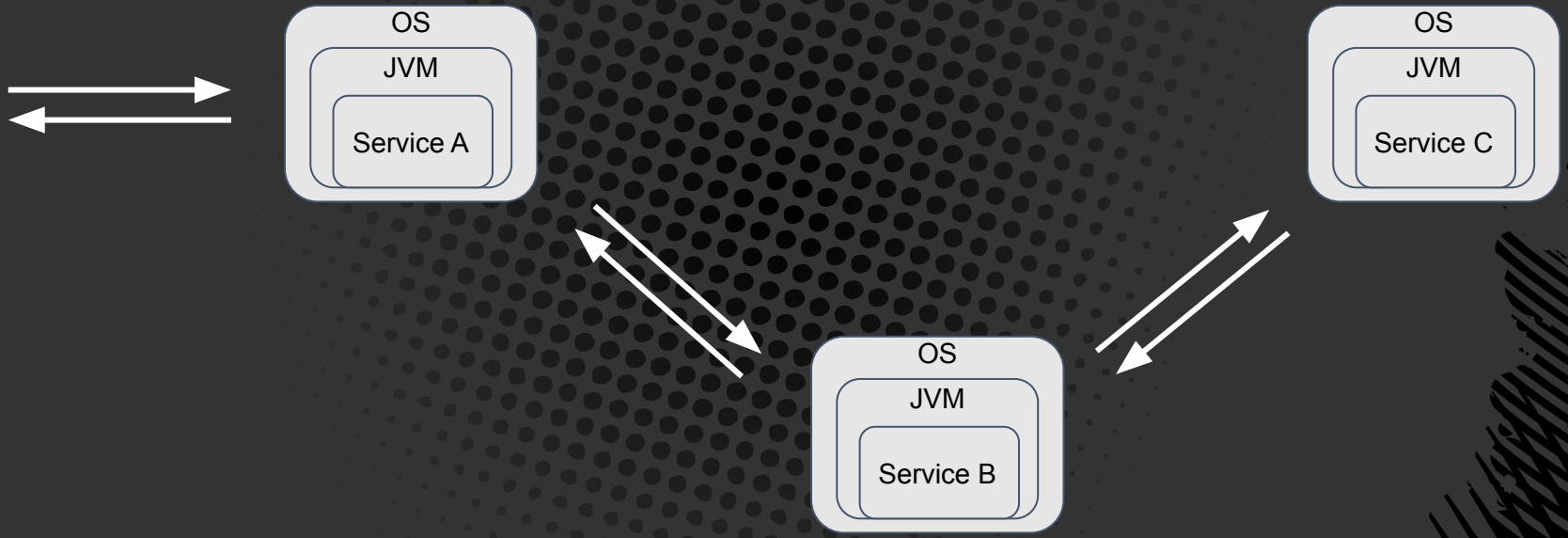
Microservices == Distributed Computing



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Fallacies of Distributed Computing

- The Network is Reliable
- Latency is zero
- Bandwidth is infinite
- Topology does not change
- There is one administrator
- Transport cost is zero
- The network is homogeneous

https://en.wikipedia.org/wiki/Fallacies_of_distributed_computing

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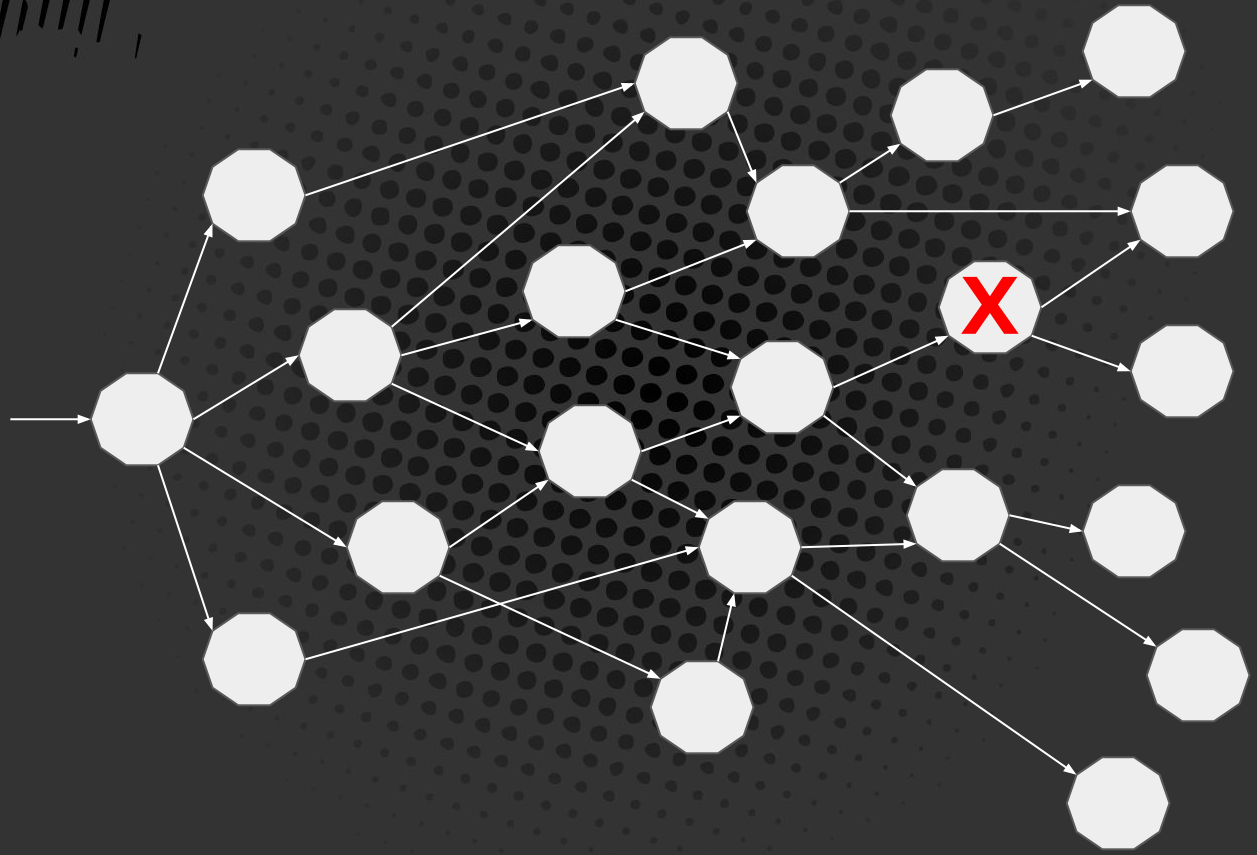
Failure of a Service



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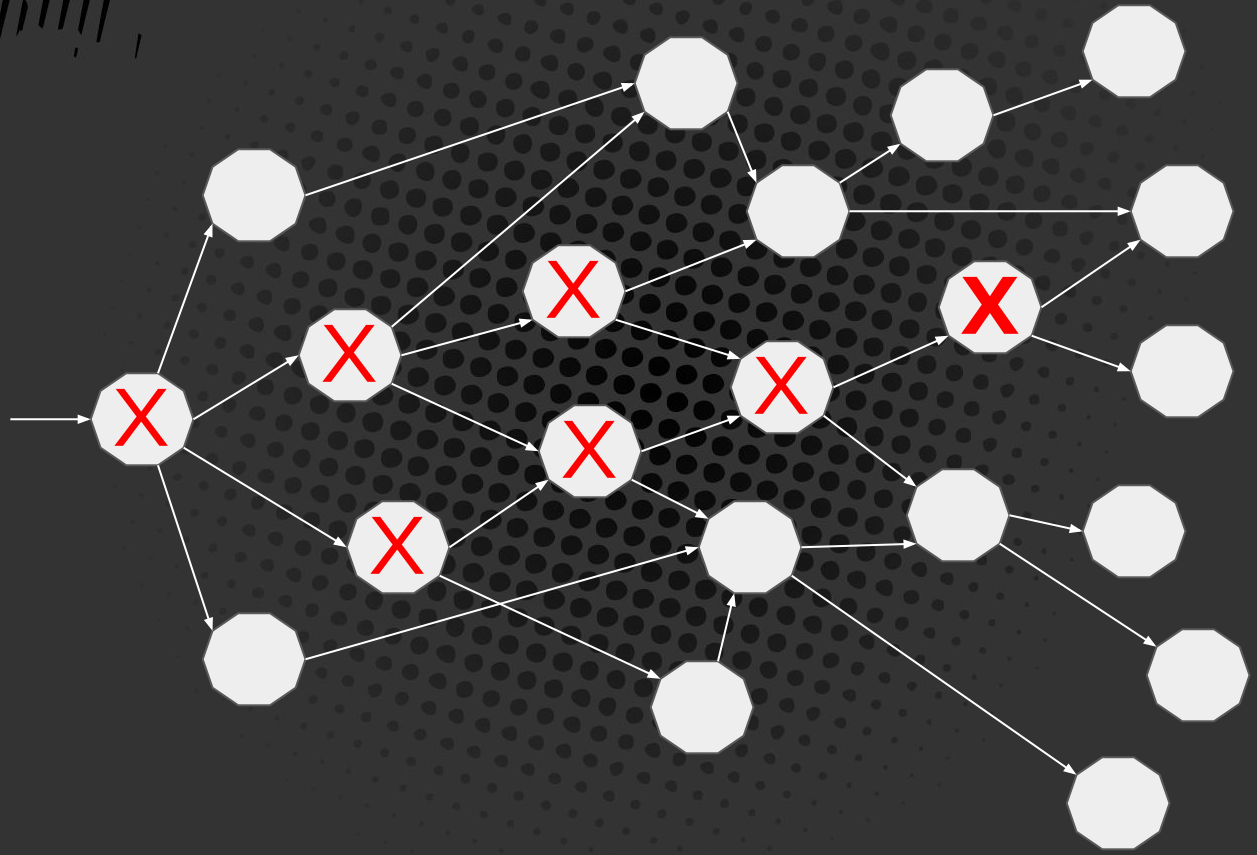
Cascading Failure



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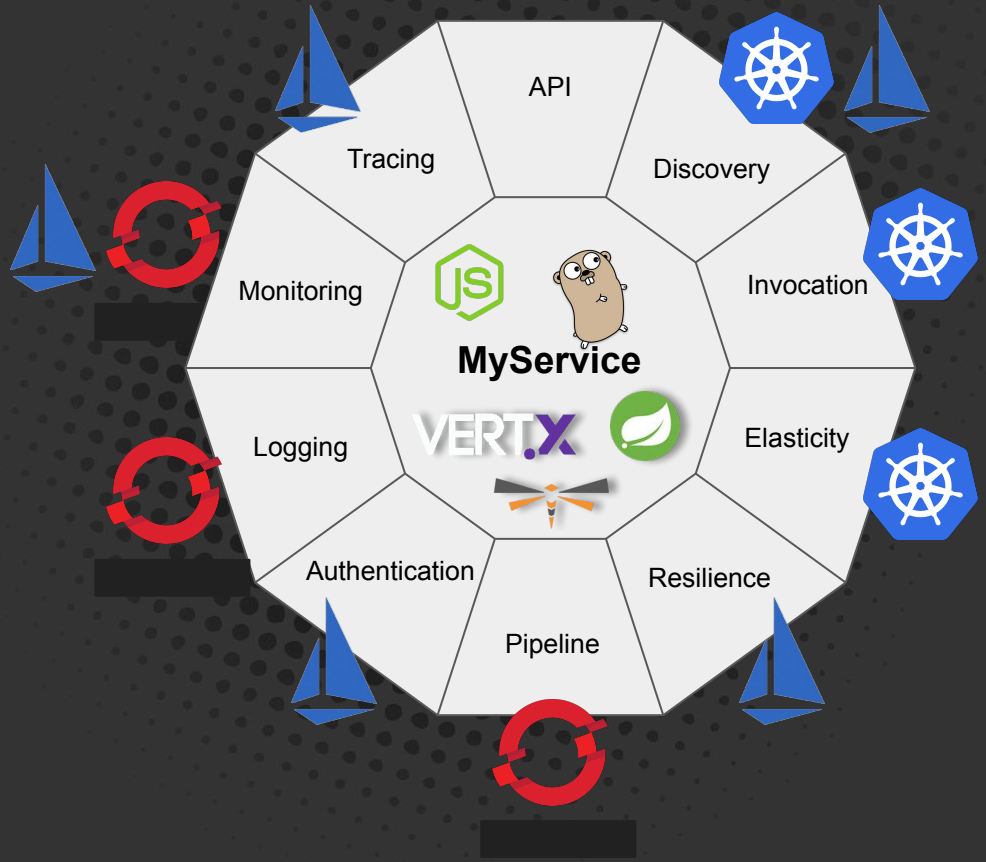
Microservices'ilities + Istio



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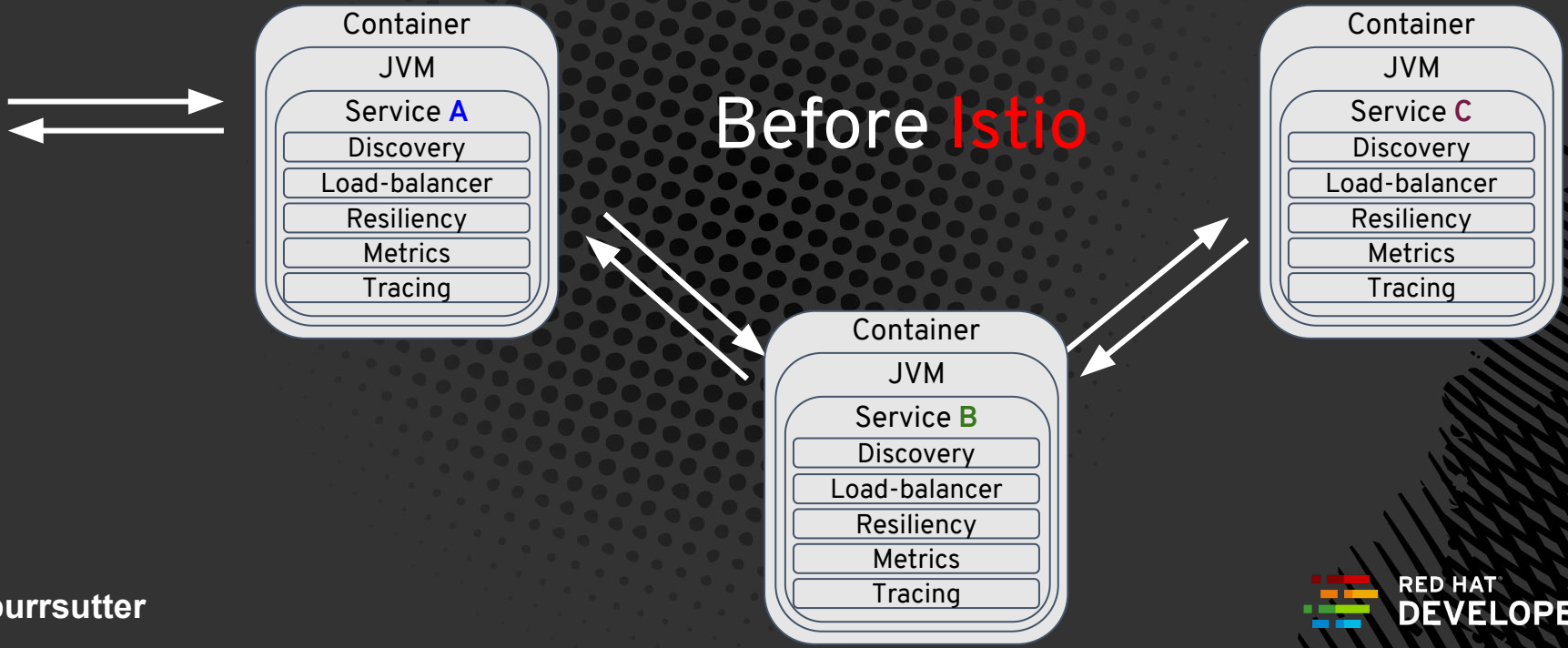
Istio

RED HAT®
DEVELOPER

Microservices embedding Capabilities



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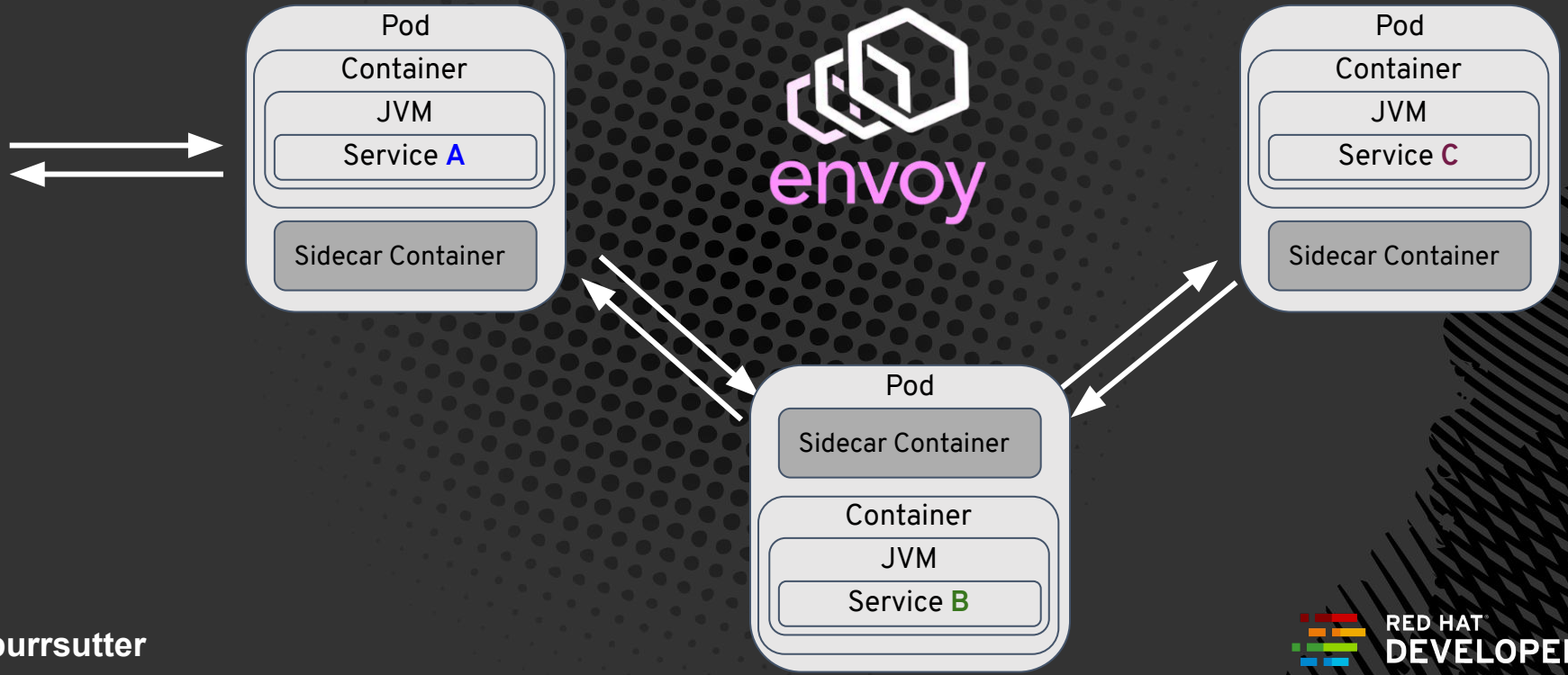
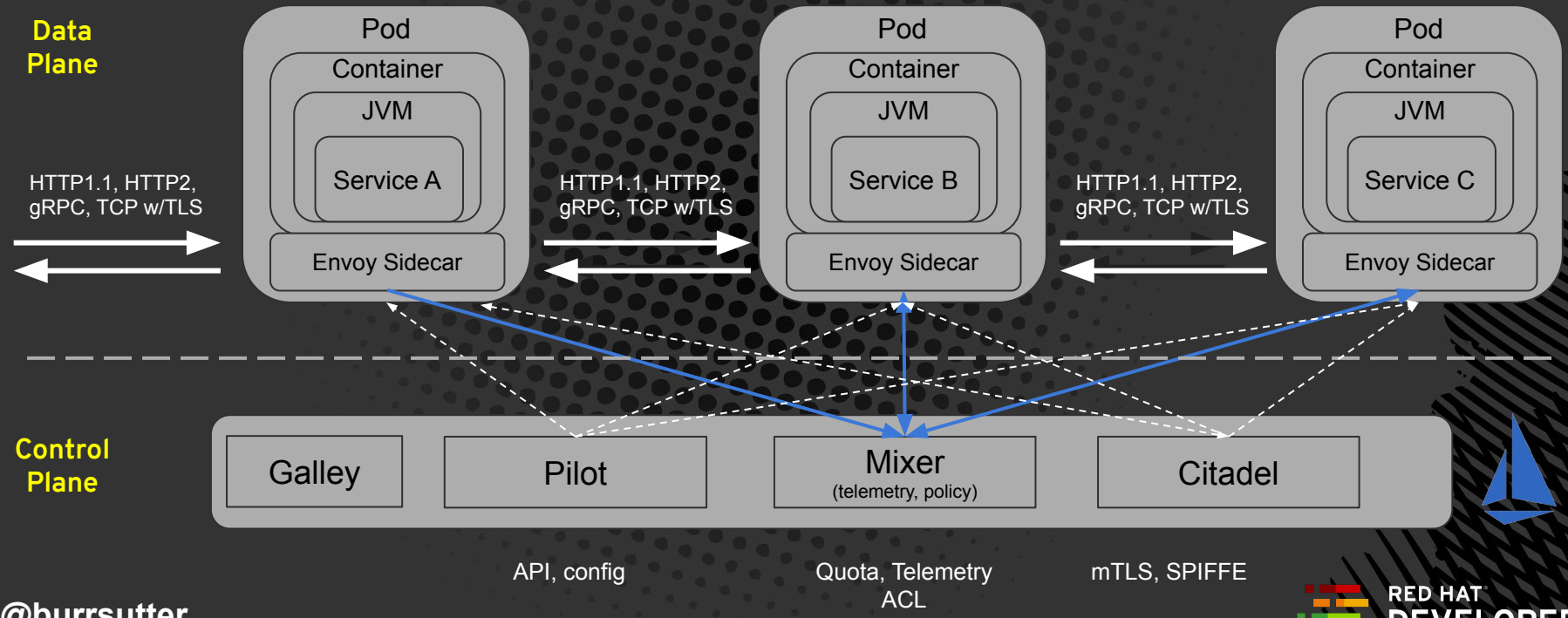
Envoy is the current sidecar



RED HAT DEVELOPER

Istio Data Plane vs Control Plane



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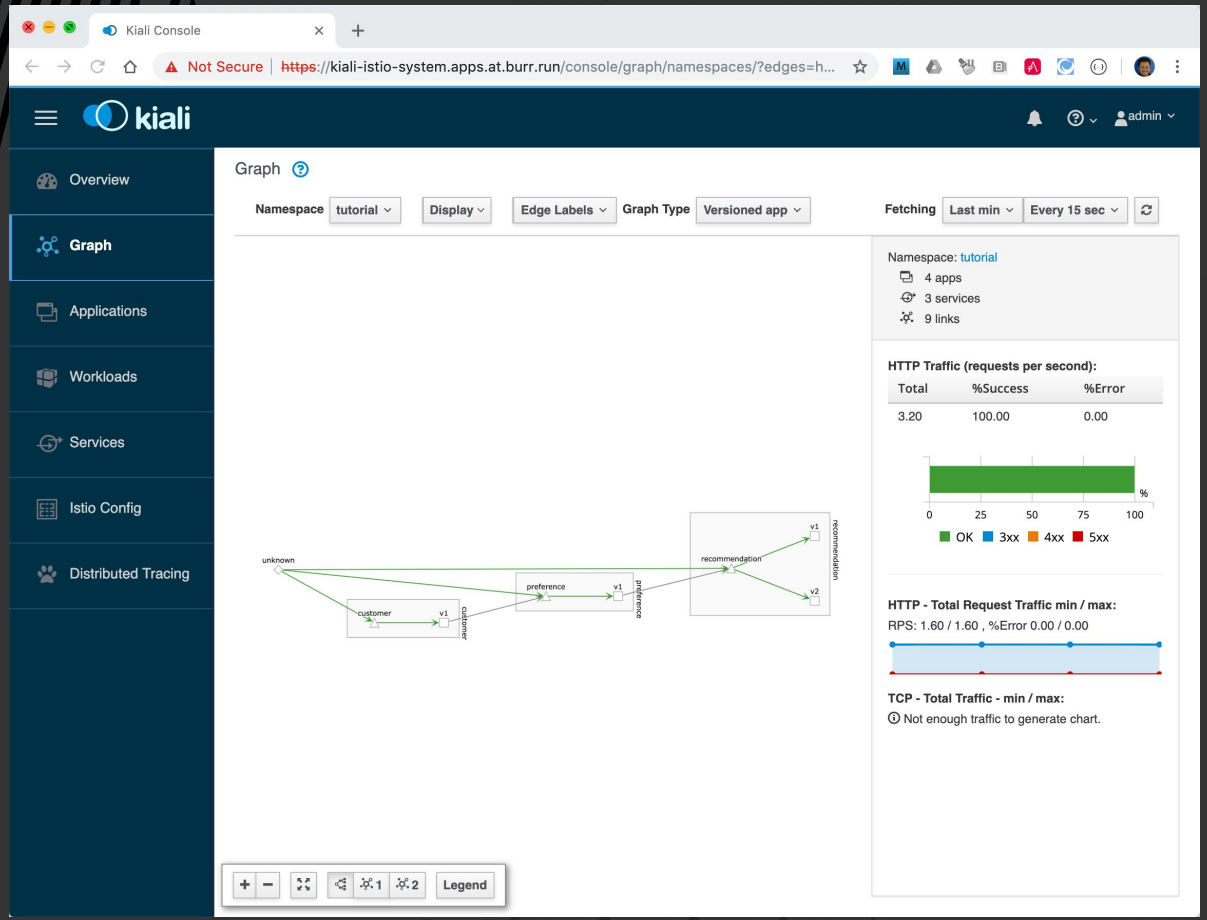

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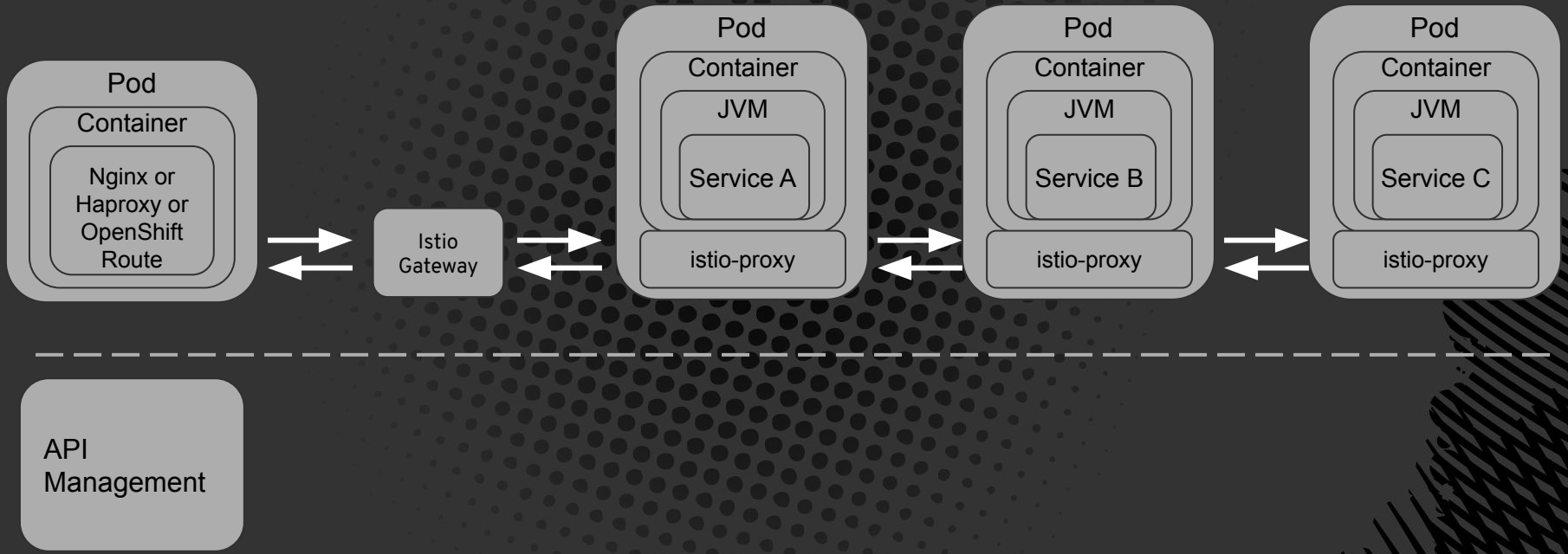
API Gateways



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Showing off is the fool's idea of glory.

— *Bruce Lee*

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DEVELOPER

"Be happy, but never satisfied.

— Bruce Lee

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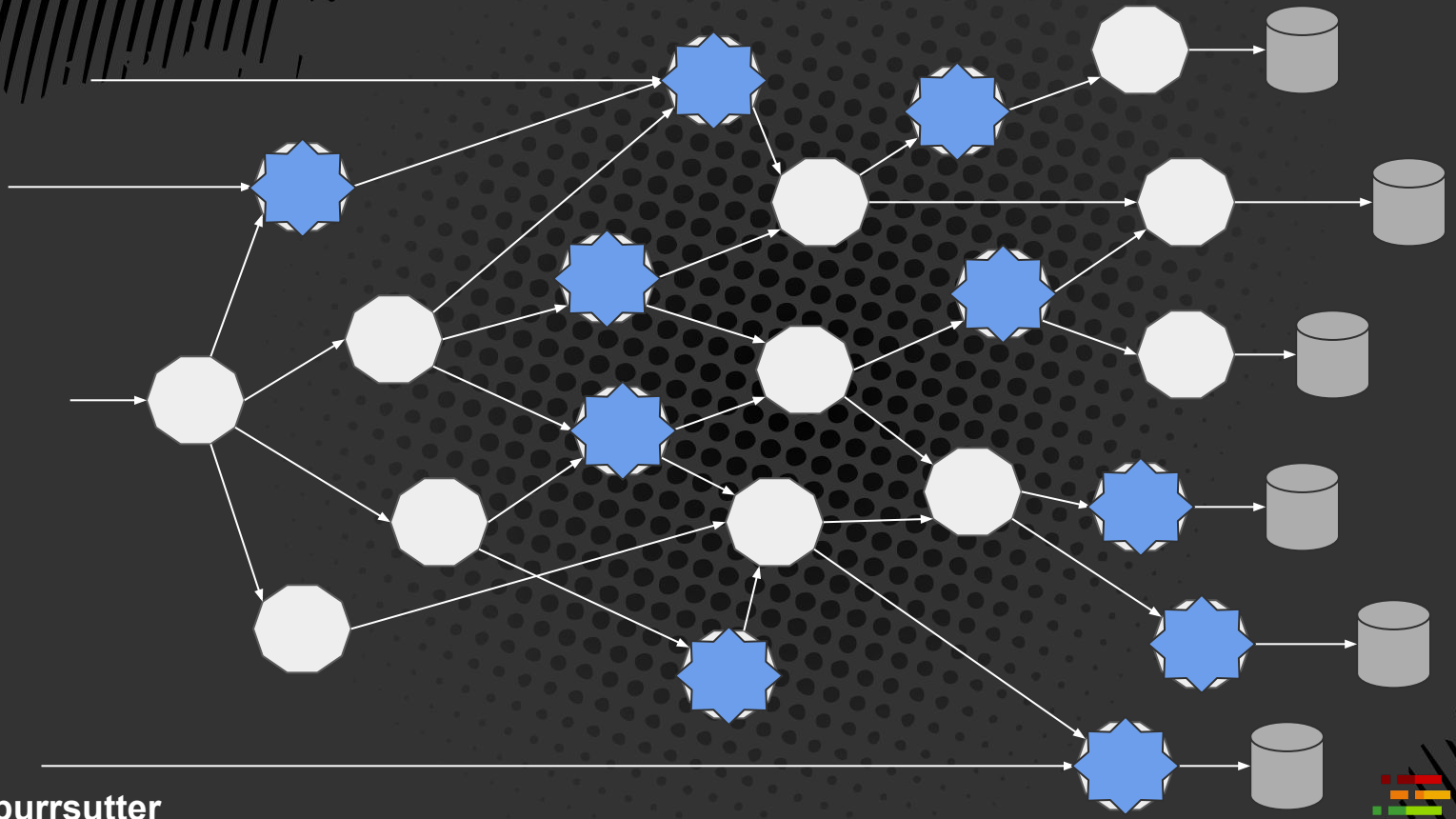
Let there be Functions?



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The first question is “is there a suitable service I can consume?” before “is there something I can buy and set up using a cloud provider?”.

Thoughtworks Nov 29 2017

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It is Serverless because of BaaS/SaaS

(managed by another party services).

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It is all about the Services

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HTTP Input/Output Service

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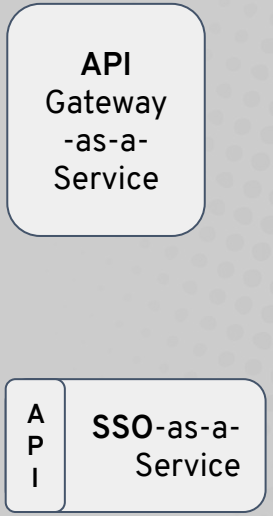
Authentication Service



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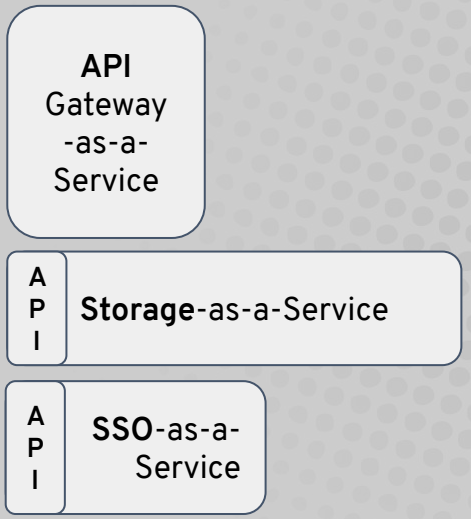
File Storage Service



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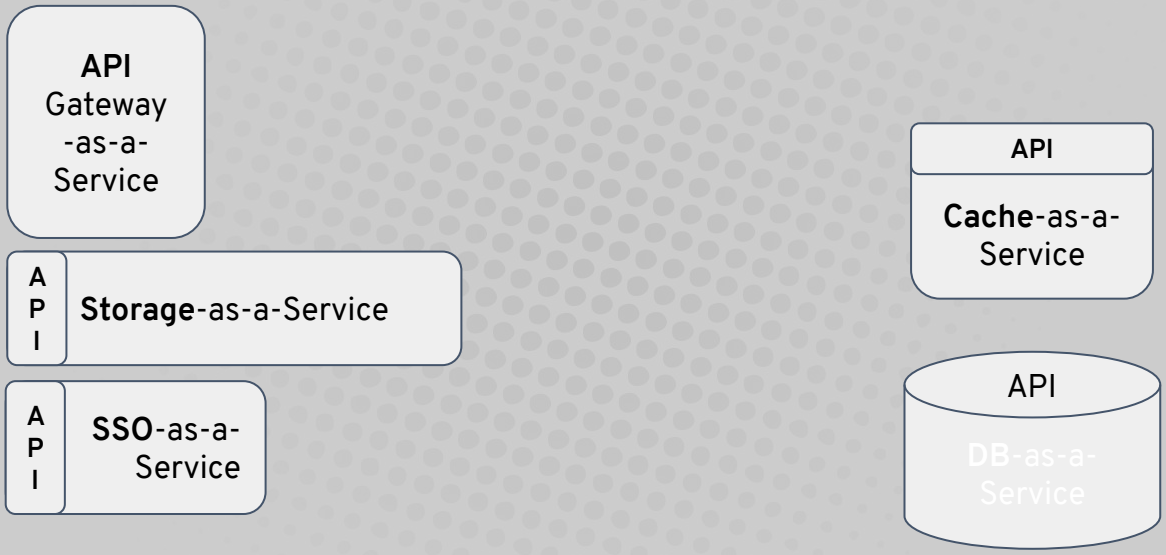
Data Services



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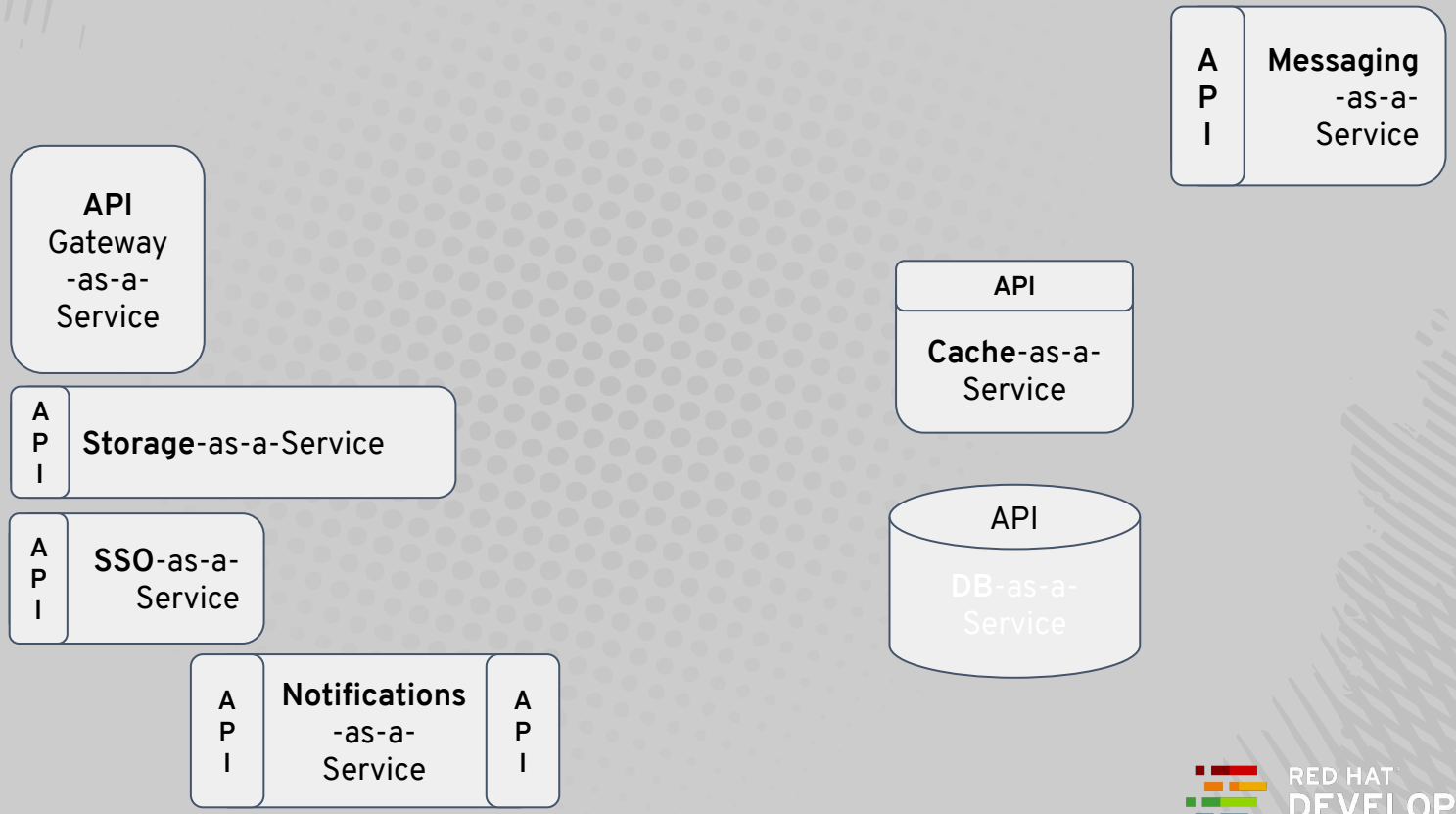
Connectivity Services



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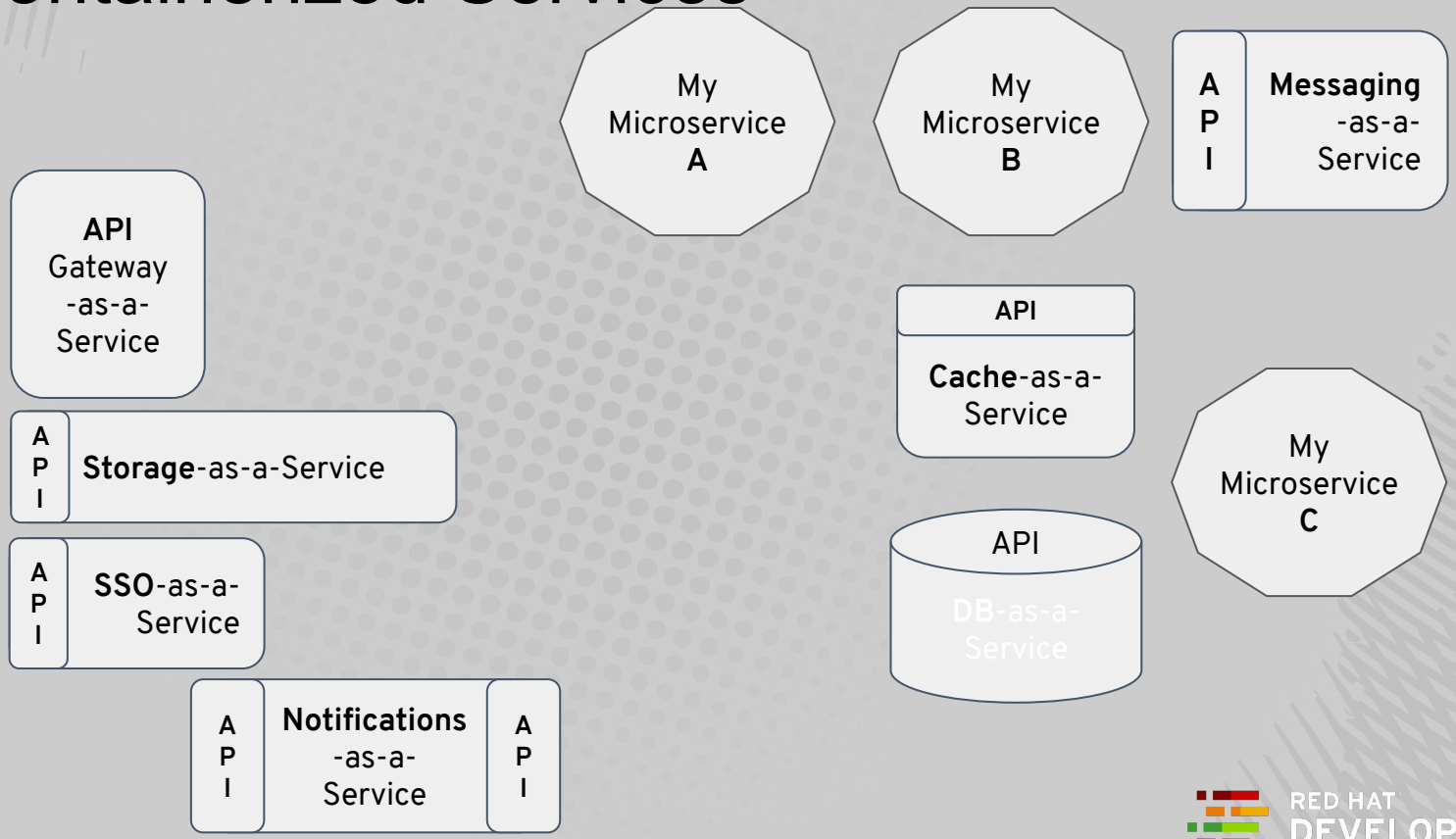
Your Containerized Services



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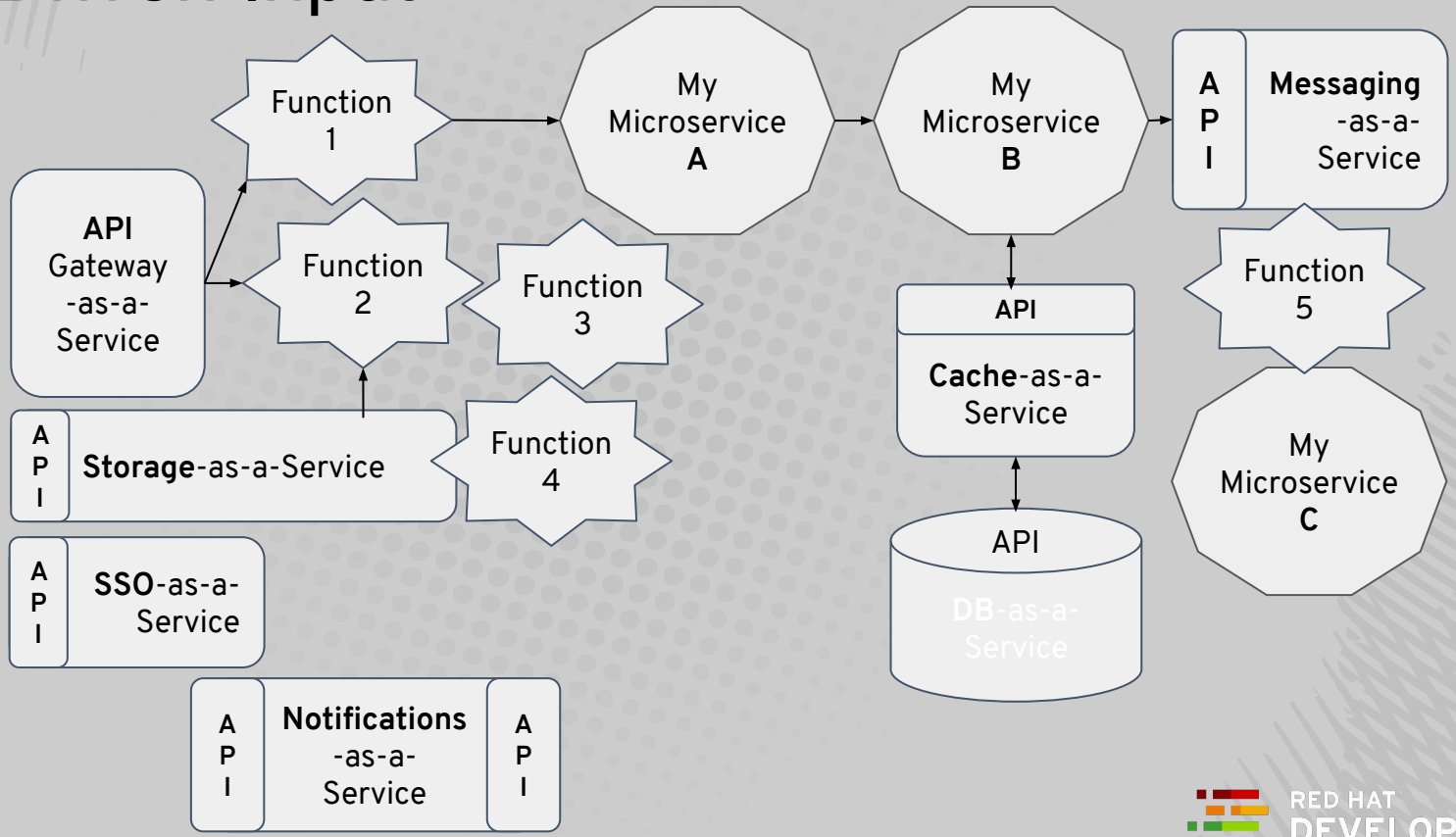
Event-Driven Input



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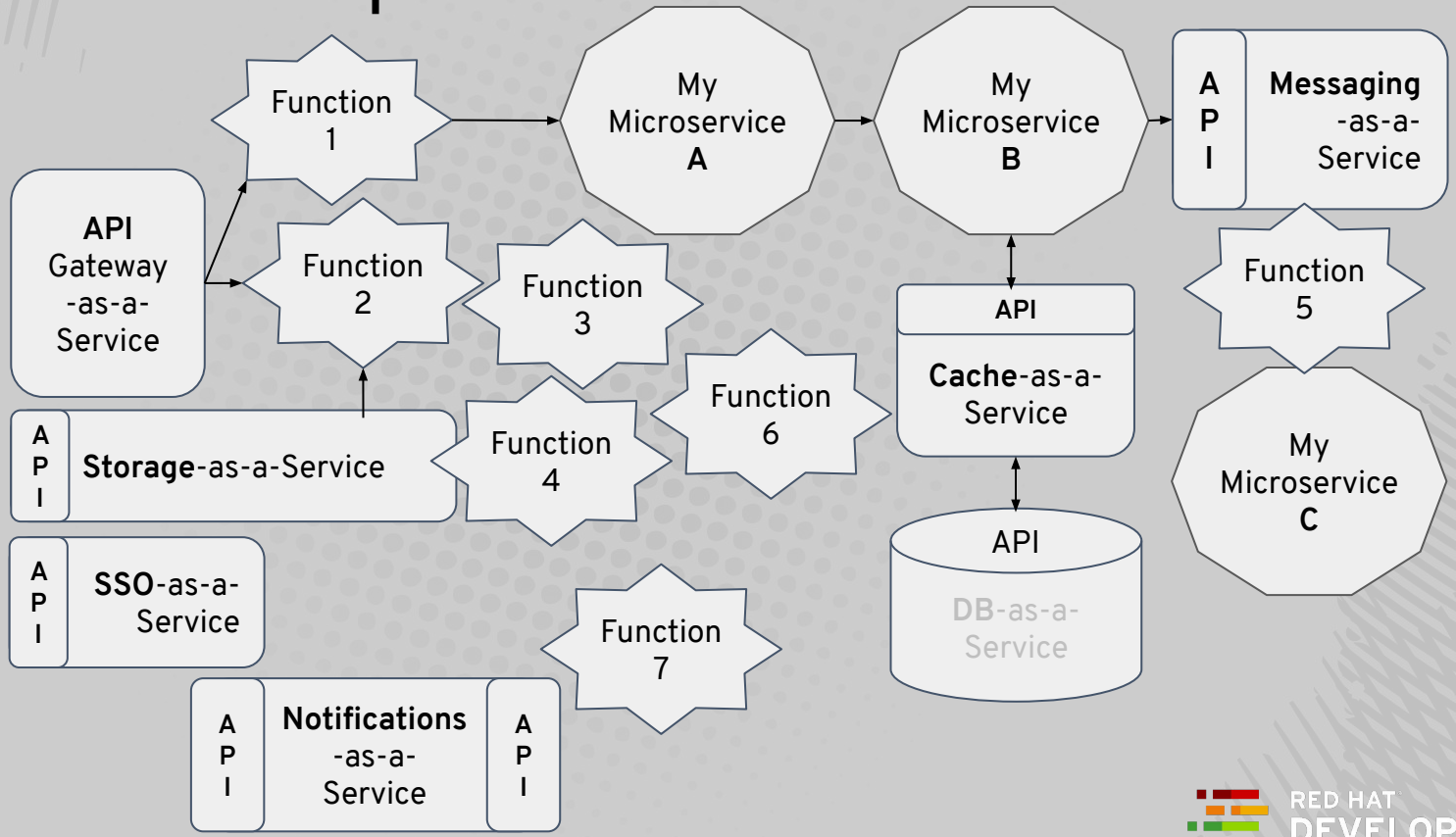
Event-Driven Output



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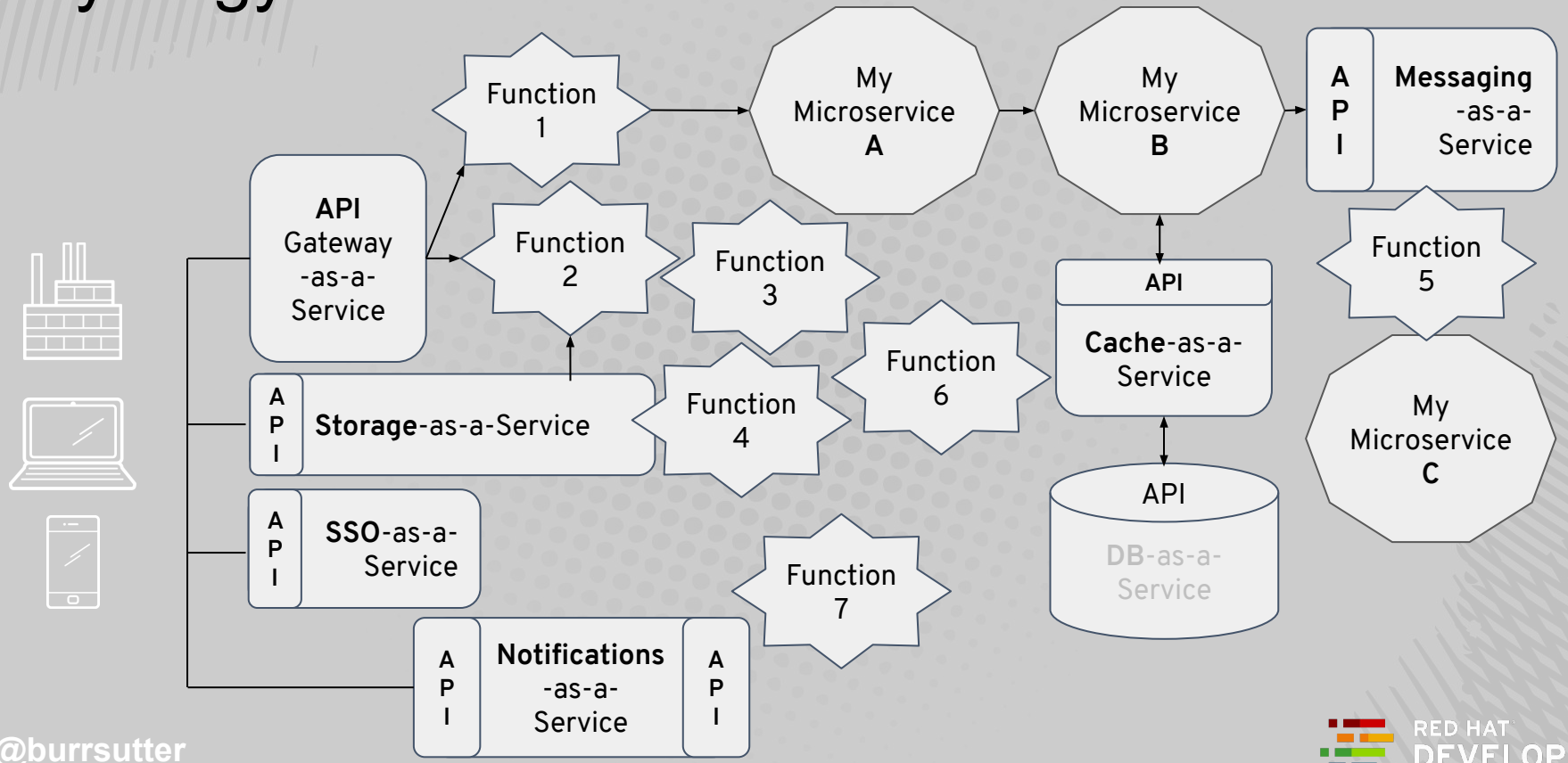
Synergy



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Supersonic, Subatomic Java

QUARKUS.IO

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Knative

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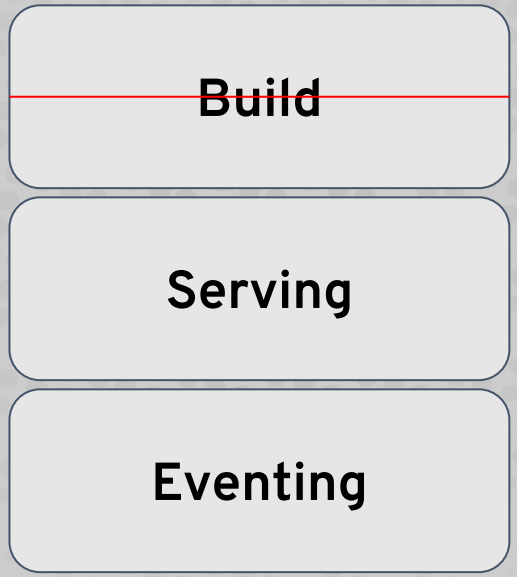
Knative's Primary Components



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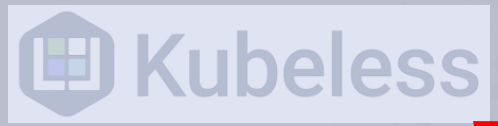
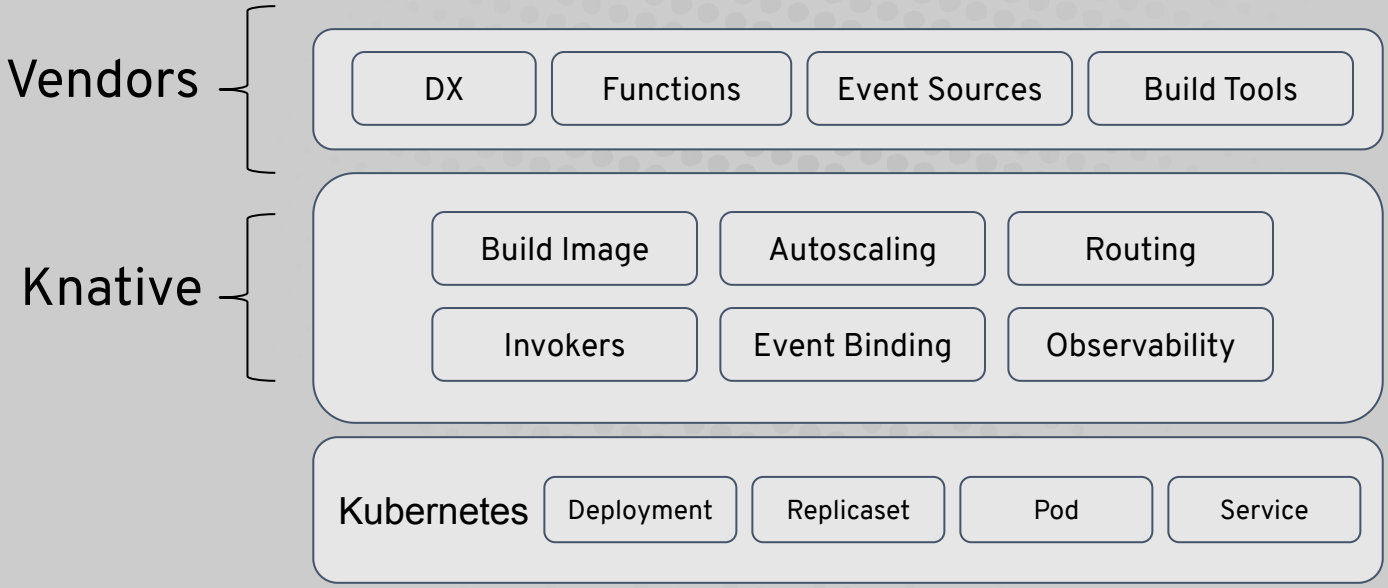
FaaS Kubernetes Players

FaaS Kubernetes Players



Why?

Primitives



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What is Knative?

"Kubernetes-based platform to build, deploy, and manage modern serverless workloads."

"Essential base primitives for all"

"Knative provides a set of middleware components that are essential to build modern, source-centric, and container-based applications that can run anywhere: on premises, in the cloud, or even in a third-party data center"

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Interesting Capabilities

- Scale-to-zero: No pod == no memory
- Scale-from-zero: Traffic spike starts N pods
- Configurations & Revisions - built-in Blue/Green
- In-Cluster Image Building
- Traffic splitting
- Eventing System (Beyond HTTP)

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Knative Serving

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Knative Serving

```
kubectl get crd | grep serving
```

```
configurations.serving.knative.dev
revisions.serving.knative.dev
routes.serving.knative.dev
services.serving.knative.dev
```


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Knative Serving Autoscaler

kubectl -n knative-serving edit configmap config-autoscaler

```
container-concurrency-target-default: "1"

scale-to-zero-grace-period: 30s

stable-window: 30s
```


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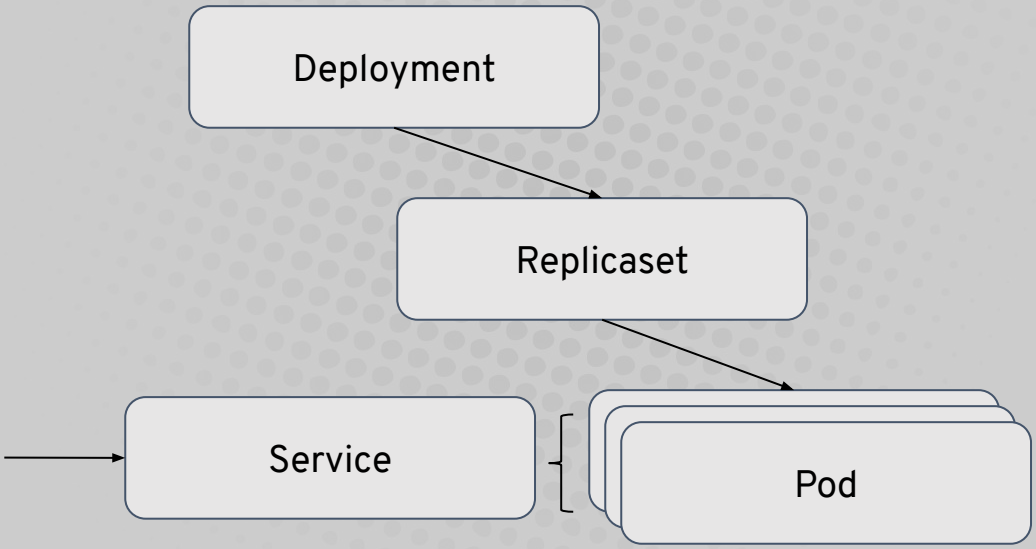
kubectl apply -f Deployment.yaml



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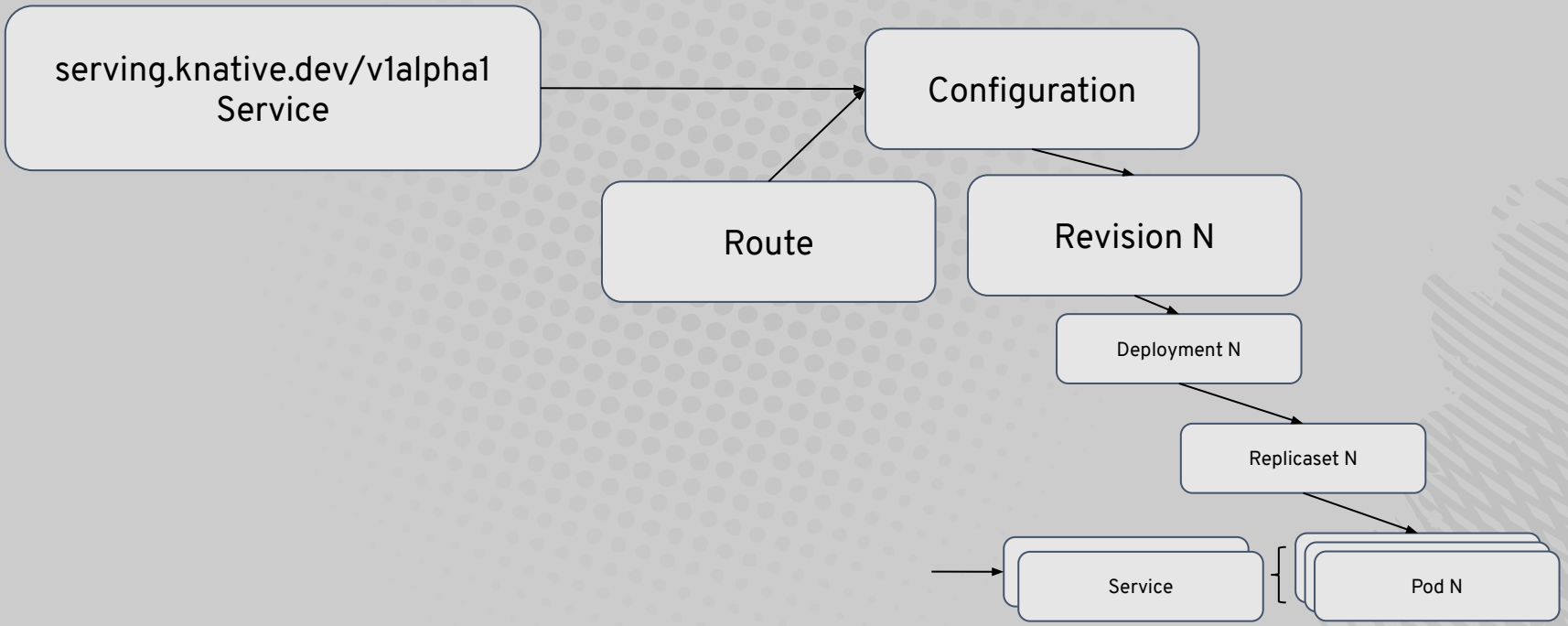
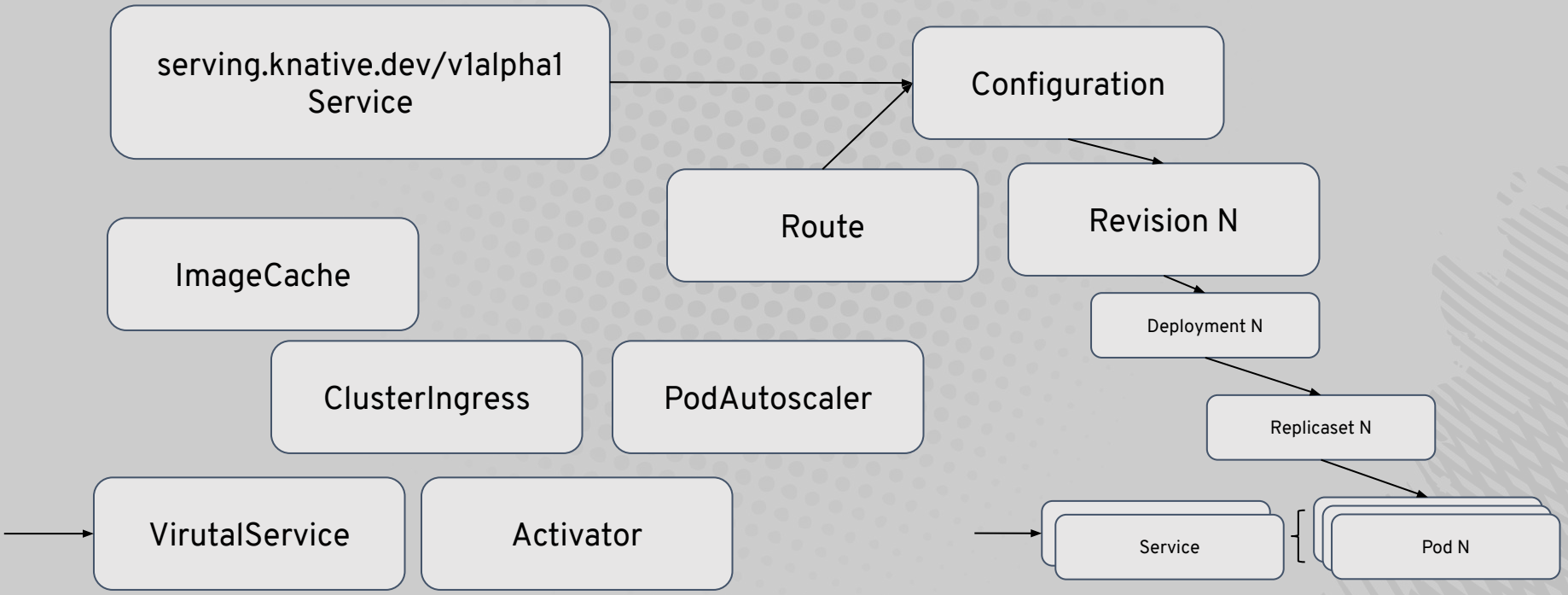
kubectl apply -f ksvc.yaml



kubectl apply -f ksvc.yaml



Knative Build

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Knative Build

```
kubectl get crd | grep build
```

```
builds.build.knative.dev

buildtemplates.build.knative.dev

clusterbuildtemplates.build.knative.dev
```


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Knative Build Resources

1. Secret	User ID/Password for remote registry
2. ServiceAccount	Associated with the Secret
3. PVC: Maven	Caches Maven downloads
4. PVC: Image Cache	Caches Linux image downloads
5. Build	The Steps
6. Service	Knative Serving Service

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TEKTON

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Knative Eventing

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Knative Eventing Sources

Github
Websockets
AWS SQS
GCP PubSub
Apache Kafka
Apache Camel

https://github.com/knative/eventing-sources/tree/master/contrib

https://github.com/knative/eventing-sources

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Knative Eventing

```
kubectl get crd | grep eventing
```

```
channels.eventing.knative.dev

subscriptions.eventing.knative.dev

cronjobsources.sources.eventing.knative.dev

githubsources.sources.eventing.knative.dev

kuberneteseventsources.sources.eventing.knative.dev

containersources.sources.eventing.knative.dev
```


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Resources

https://learning.oreilly.com/live-training/ (search for "burr")

bit.ly/9stepsawesome - Introduction to Kubernetes (recording)

bit.ly/istio-tutorial - Istio: Enter the Service Mesh (bit.ly/istio-intro)

bit.ly/knative-tutorial

bit.ly/quarkus-tutorial

https://blog.openshift.com/knative-building-your-serverless-service/

https://blog.openshift.com/knative-serving-your-serverless-services/

https://blog.openshift.com/knative-configurations-routes-and-revisions/

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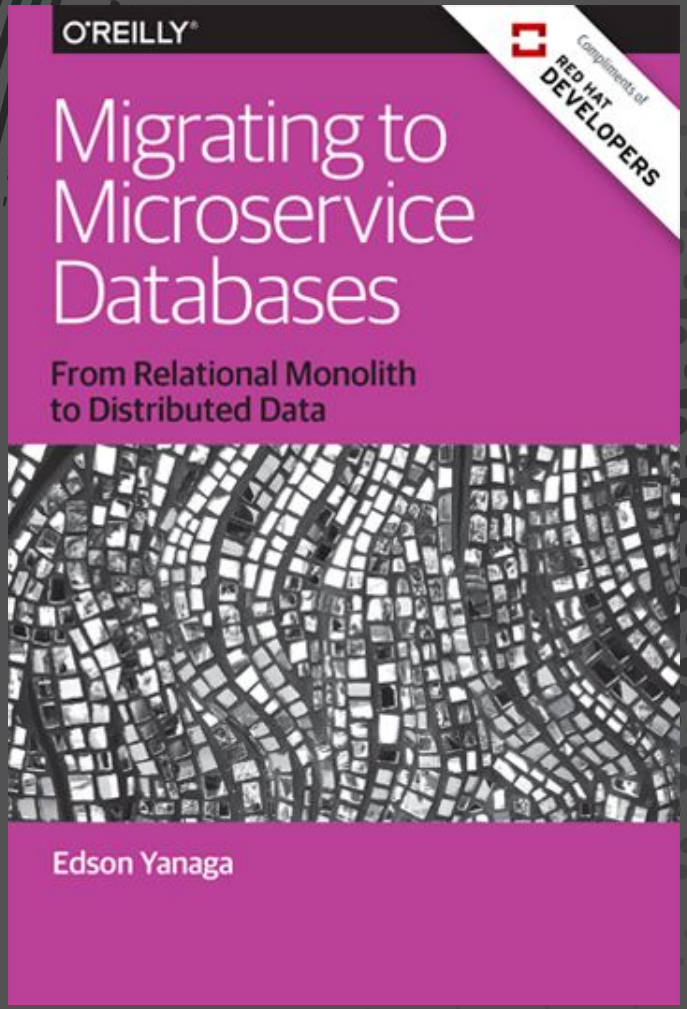

bit.ly/mono2microdb

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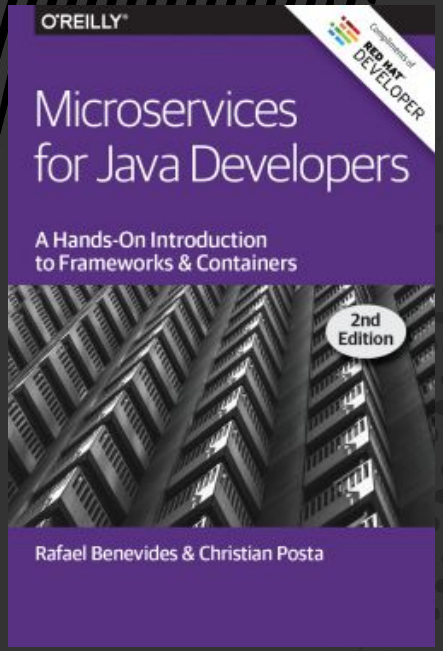
bit.ly/javamicroservicesbook

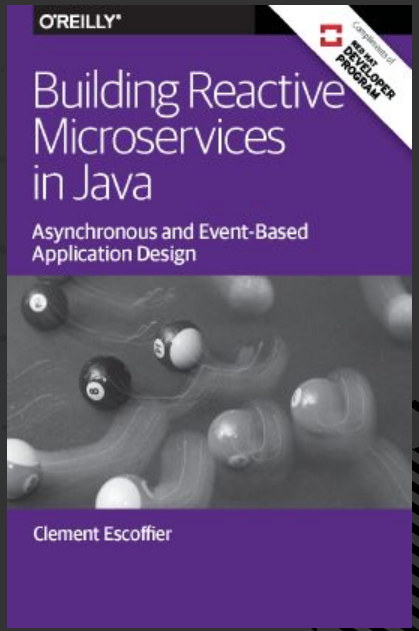


Free eBooks from developers.redhat.com

Microservices Introductory Materials

Demo: bit.ly/msa-instructions
Slides: bit.ly/microservicesdeepdive
Video Training: bit.ly/microservicesvideo
Kubernetes for Java Developers
9 Steps to Awesome with Kubernetes

bit.ly/reactivemicroservicesbook



Advanced Materials

bit.ly/istio-tutorial
bit.ly/knative-tutorial
learn.openshift.com/servicemesh

bit.ly/istio-intro
bit.ly/serverlesskube

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"Don't fear failure.
Not failure, but low aim,
is the crime.
In great
attempts it is
glorious even to fail.

— Bruce Lee

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It’s just the beginning ...
The End
bit.ly/RigaBurr2019

MEANWHILE, IN CONTAINER-LAND ...
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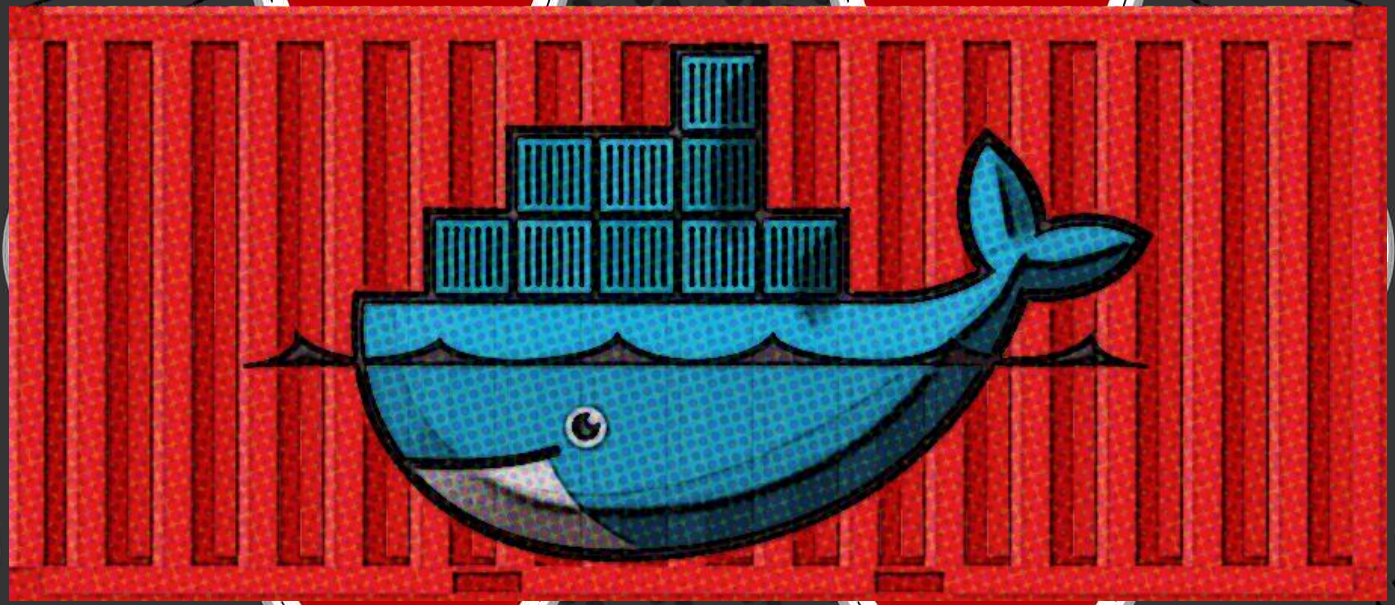

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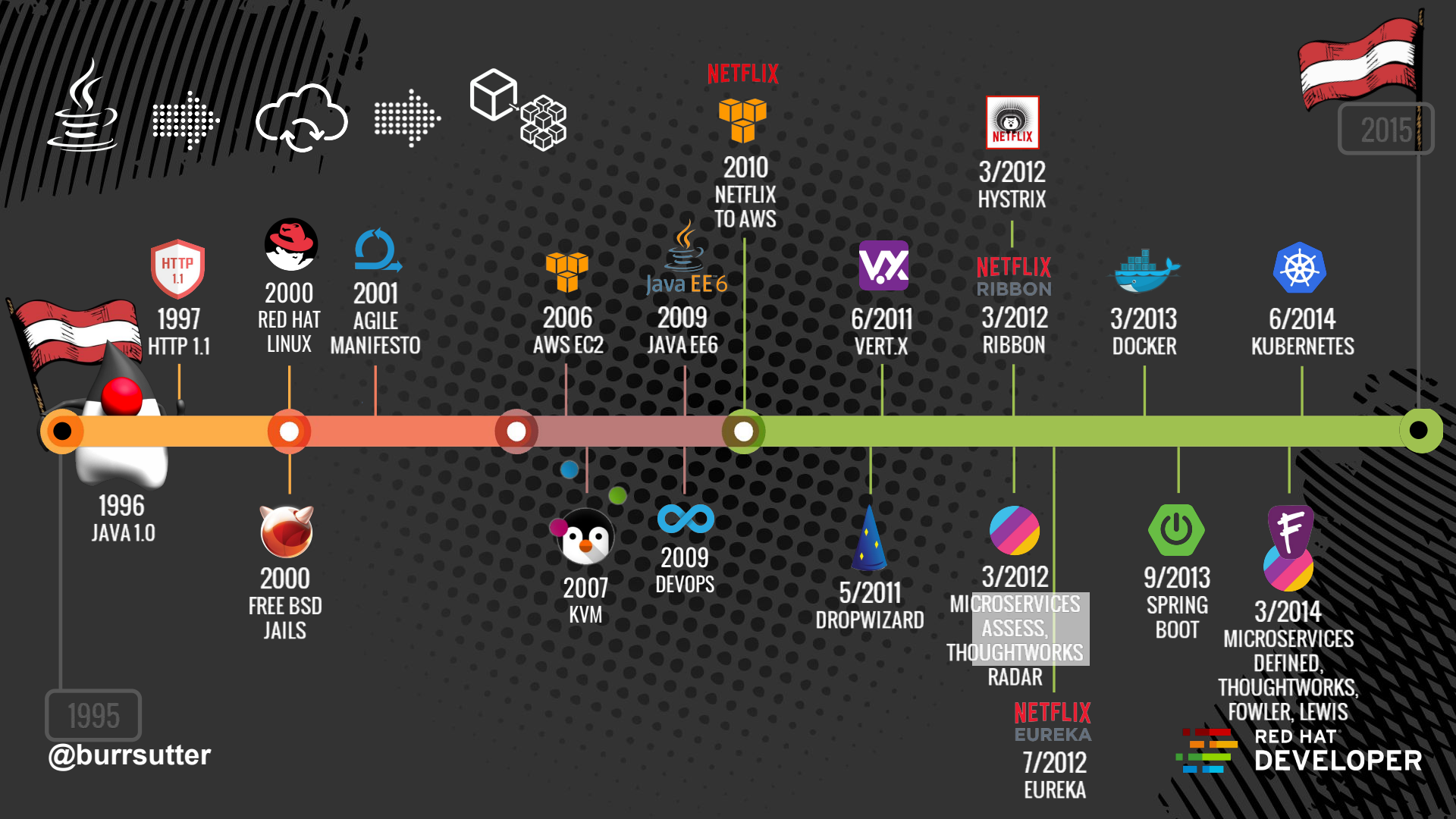
1995
1996
JAVA 1.0
1997
HTTP 1.1
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RED HAT
LINUX
2000
FREE BSD
JAILS
2001
AGILE
MANIFESTO
2006
AWS EC2
2007
KVM
2009
JAVA EE6
2009
DEVOPS
NETFLIX
2010
NETFLIX
TO AWS
6/2011
VERT.X
5/2011
DROPWIZARD
3/2012
HYSTRIX
NETFLIX
RIBBON
3/2012
RIBBON
3/2012
MICROSERVICES
ASSESS,
THOUGHTWORKS
RADAR
NETFLIX
EUREKA
7/2012
EUREKA
3/2013
DOCKER
9/2013
SPRING
BOOT
6/2014
KUBERNETES
3/2014
MICROSERVICES
DEFINED,
THOUGHTWORKS,
FOWLER, LEWIS
2015
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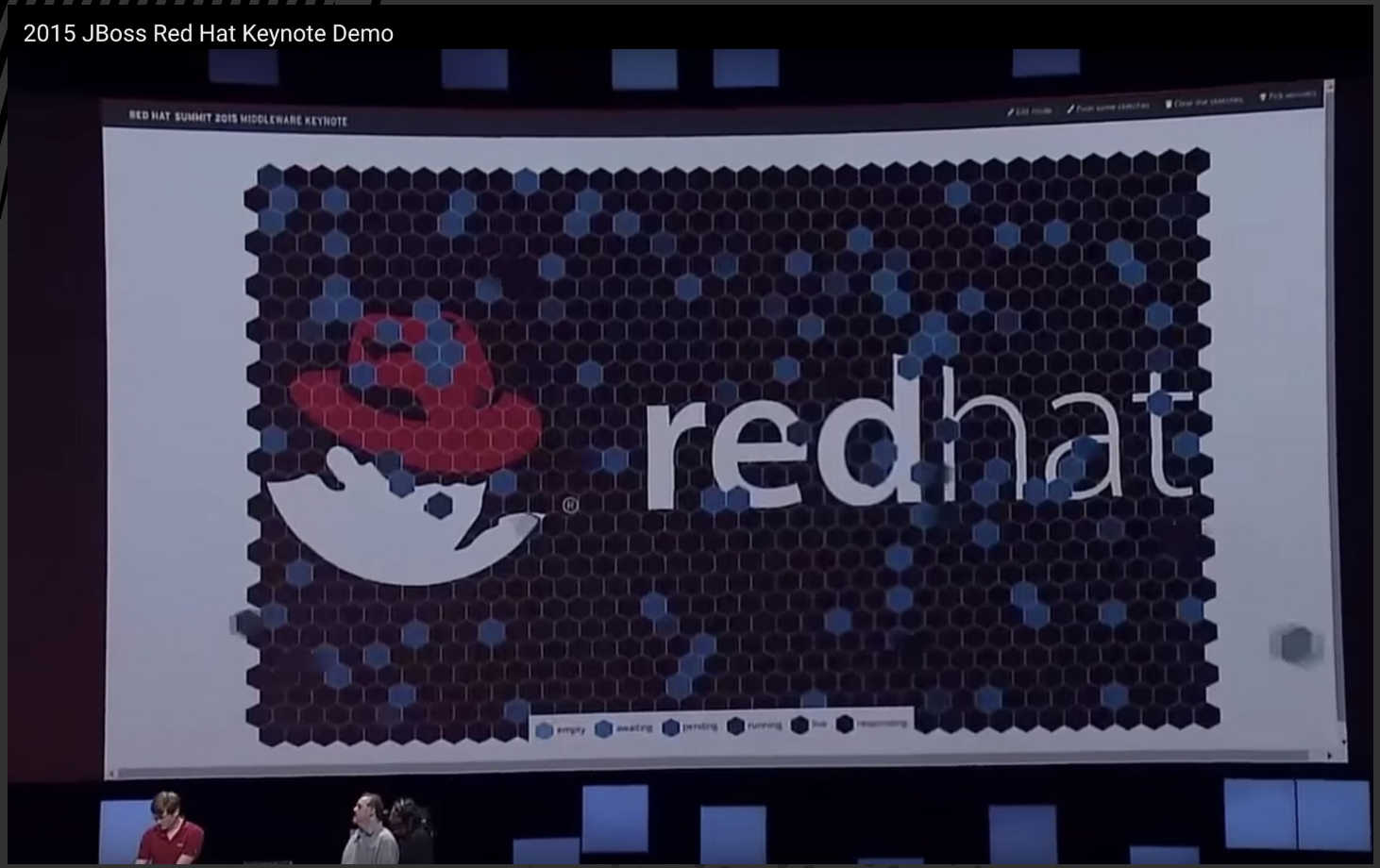
2015 JBoss Red Hat Keynote Demo



2015

Launch 1000+ Containers

Audience Claims a Container

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https://www.youtube.com/watch?v=GCtpncA0Ea0&feature=youtu.be&t=1031

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Supersonic, Subatomic Java

QUARKUS.IO

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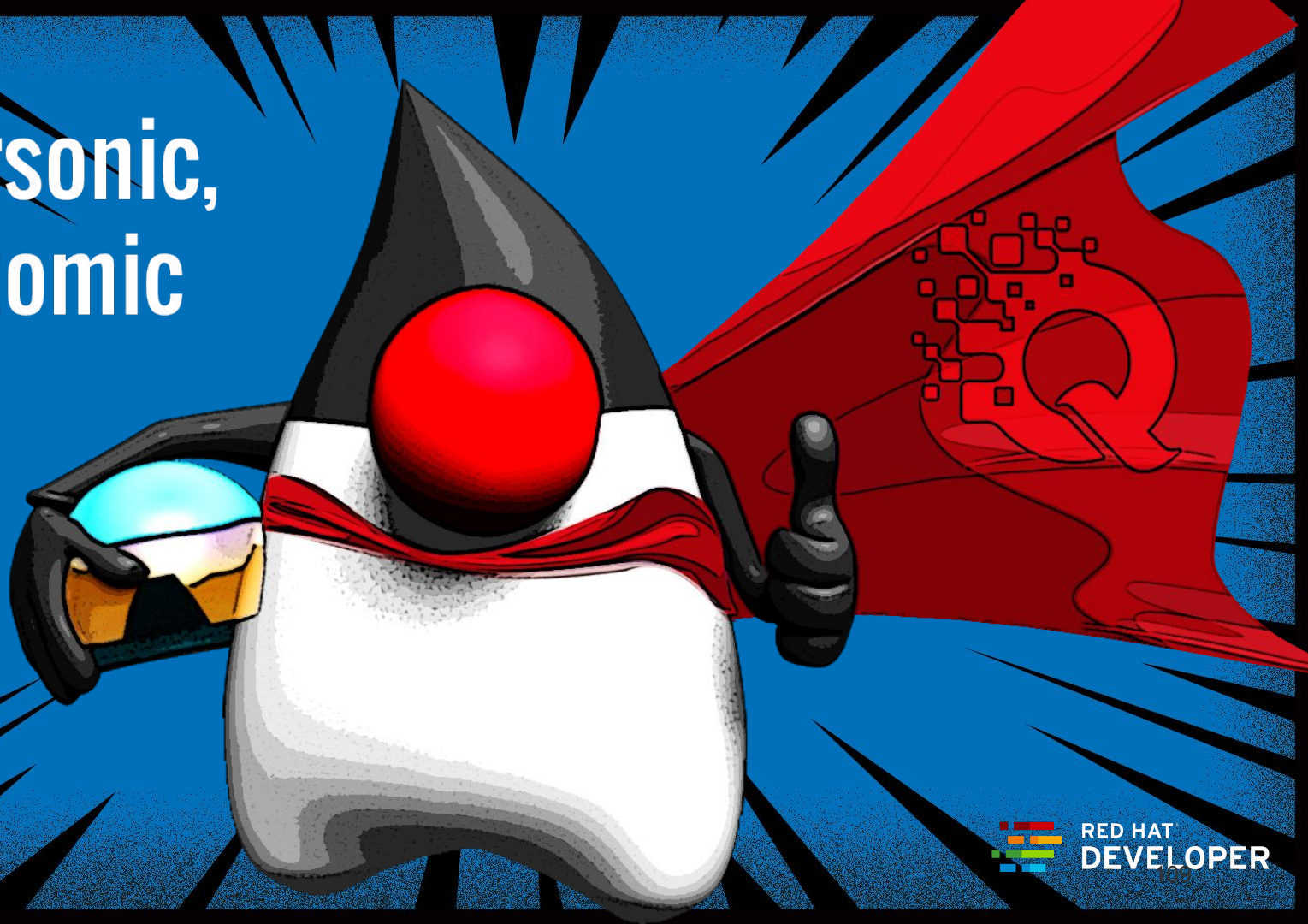
Supersonic, Subatomic Java

QUARKUS.IO



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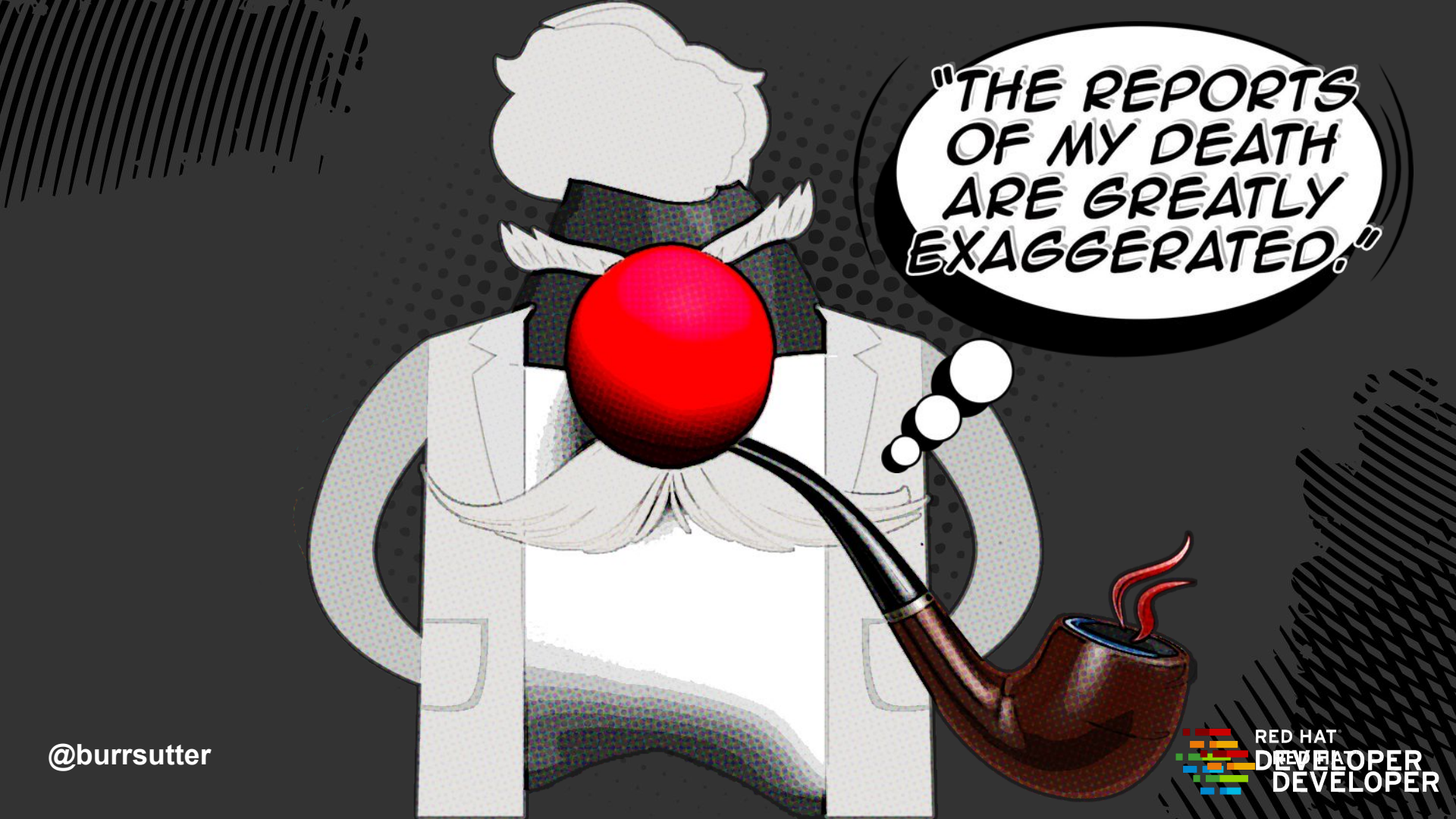

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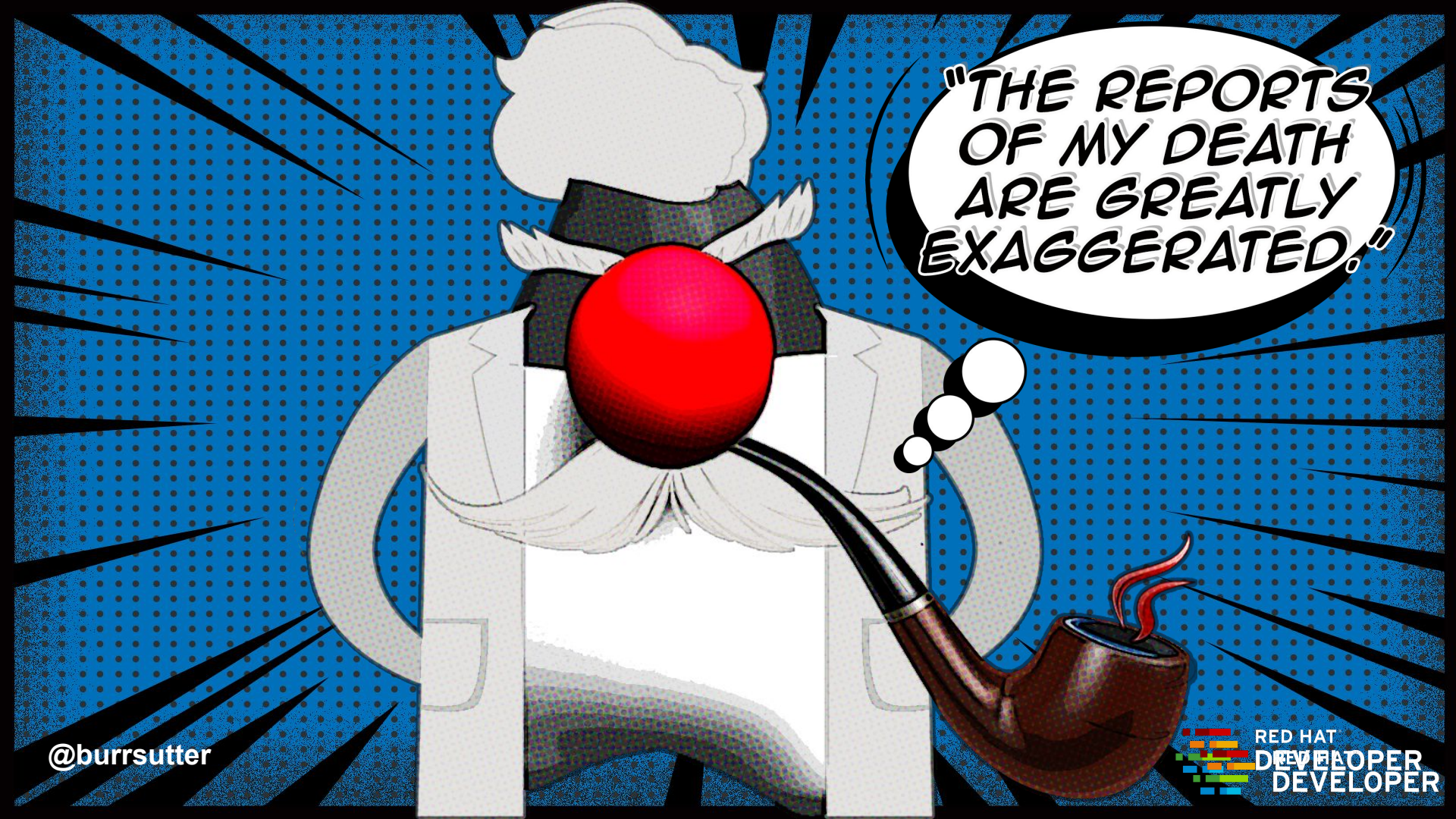
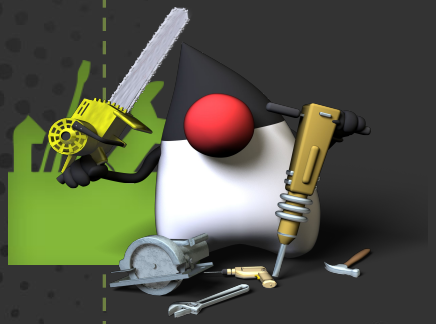

"THE REPORTS OF MY DEATH ARE GREATLY EXAGGERATED."
@burrsutter
RED HAT DEVELOPER

Still, so much goodness ...

@burrsutter

RED HAT DEVELOPER



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Meet Quarkus

Supersonic Java

developer

Enough ^ love to go around.

@burrsutter

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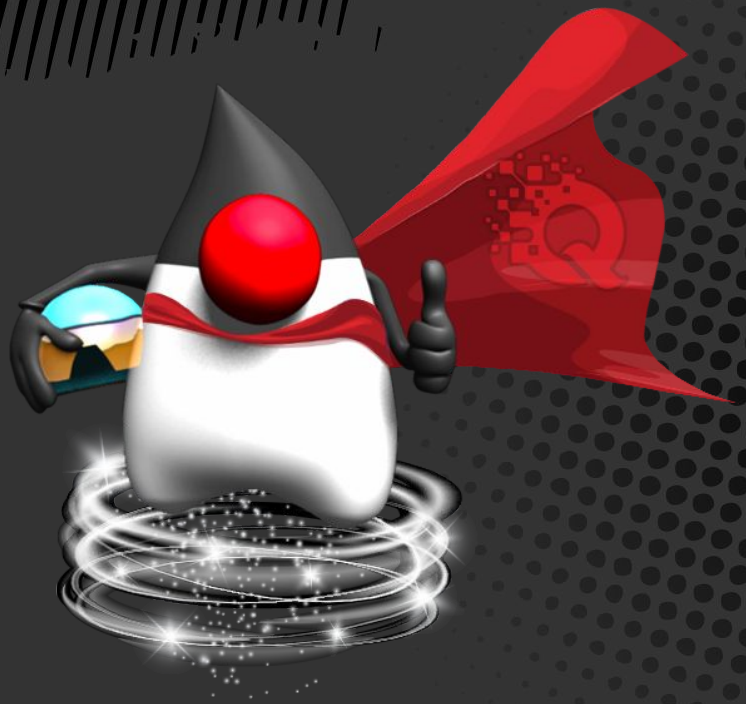

Live reload

Imperative and reactive

Serverless

Microservices

Fat jars and native executables

Optimized for JAX-RS & JPA (Hibernate) ...

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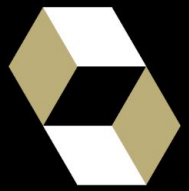
ECLIPSE VERT.X



HIBERNATE

RESTEASY

APACHE CAMEL

ECLIPSE MICROPROFILE

NETTY

KUBERNETES

OPENSHIFT

JAEGER

PROMETHEUS

APACHE KAFKA

INFINISPAN

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Kubernetes Native

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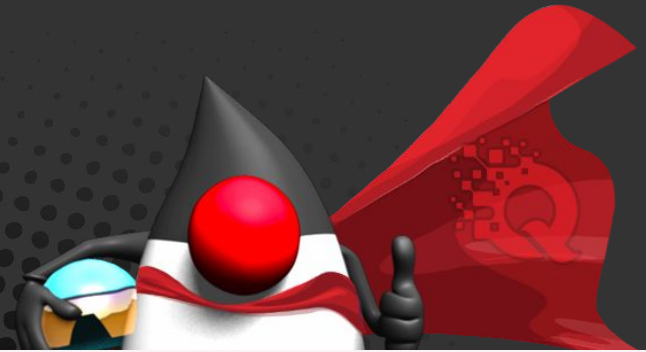

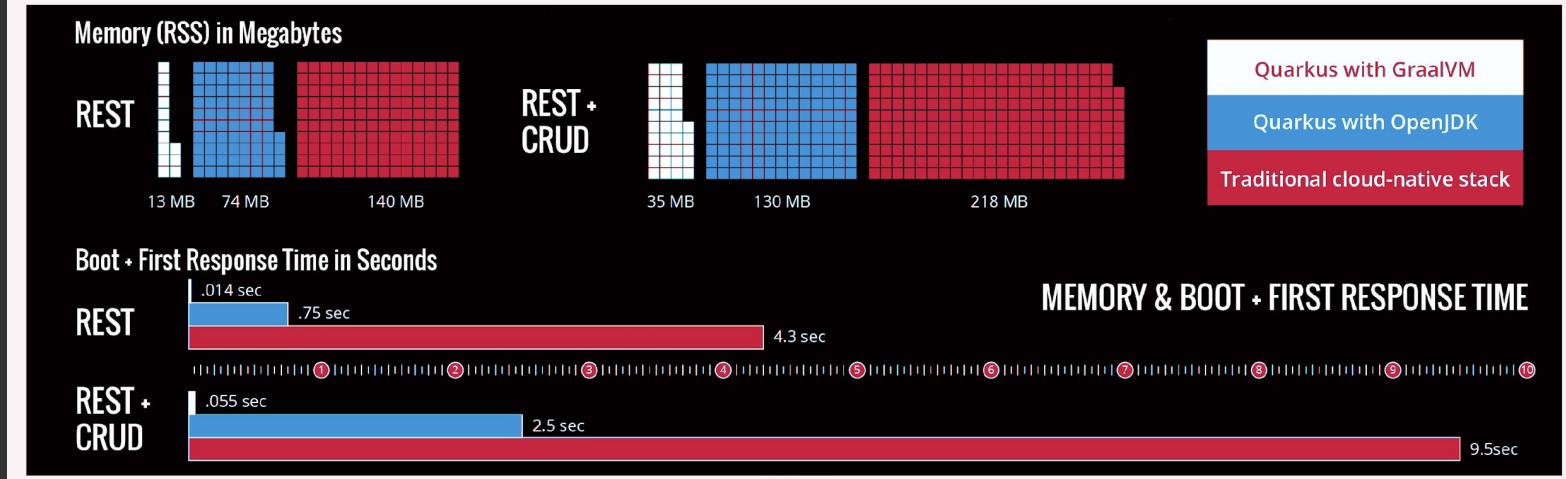

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